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AVIATION CALENDAR

(Continued from page 5)

national Union of Goodway and Goodway, in cooperation with International Employment Team, University of Toronto, Canada

Sept. 9-10—Annual General Meeting, International Air Transport Assn., Madrid

Sept. 9-13—Twelfth Annual International Automobile Conference & Exhibit, Cleveland Automobile, Cleveland, Ohio

Sept. 10—Third Pacific Area National Meeting American Society for Testing Materials, Sheraton Palace Hotel, San Francisco, Calif.

Sept. 11—1957 Gordon Perry and Flying Display, Royal Aeronautical Society, Weybridge, Surrey, England

Sept. 16-21—1956 Michigan Aeronautics Conference, jointly sponsored by University of Michigan Transportation Institute, Western Michigan University and The Aero Club of Michigan, Ann Arbor, Mich.

Oct. 1-5—National Aeronautics Meeting, Aircraft Production Forum & Aircraft Engineering Display, Hotel Ambassador, Los Angeles

Oct. 2-4—Twelfth Annual Meeting and Forum, National Business Aircraft Assn., Commodore Hotel, Denver, Colo.

Oct. 6-12—Eight International Automobile Congress, Barcelona, Spain, Regency Aguarda Automobiles Espanolas, Avda. Castellana 100, 277, Barcelona

Oct. 7-9—1956 Annual National Electronics Conference, Chicago, Ill.

Oct. 7-10—Tenth Symposium, Low Flight Propulsion Laboratory, Cleveland

Oct. 7-11—Eighty-third Annual Congress, International Astronautical Federation, Barcelona, Spain. For details write: IAF 15 Lovell Rd., Concord, Mass.

Oct. 9-11—National Fall Convention, Society for Experimental Stress Analysis, El Centro Hotel, San Diego, Calif.

Oct. 11-13—Canadian Aeronautical Institute, University of the National Science Museum, Montreal, Canada

Oct. 21-23—Conference on new developments in the field of power, American Society of Mechanical Engineers, Avon Hotel, Allentown, Pa.

Oct. 24-25—Forty-third Annual Meeting, American Electrical Engineers, Sheraton Hotel, Seattle, Wash. Pacific Airlines, Los Angeles, Calif.

Oct. 26-31—Second Winter Meeting American Weather Society, Henry Hudson Hotel, N. Y.

Oct. 28-29—Third Annual Meeting Association of the U. S. Army, Sheraton Park Hotel, Washington, D. C.

Oct. 29-30—Annual East Coast Conference on Aeronautical and Naval Engineering, Philadelphia Convention Center, Philadelphia, Pa.

Nov. 1-5—National Industrial Packaging & Handling Exposition, Atlantic City Convention Hall, N. J.

Nov. 1-5—Joint Winter Institute, Guided Missile Reliability Symposium limited to those with direct security clearance, Naval Air Station Test Center, Ft. Worth, Calif.

Nov. 16-20—International Air Transport Assn. Technical Conference, Miami, Fla.

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Typical page

What kinds of applications do you think of when magnetic tape recording is mentioned? Sound recording, of course, and television, if you are in that business. But what about controlling a rough road to test track axes, controlling a milling machine to cut an aircraft wing section out of a solid billet, monitoring for a sudden occurrence that may happen only once in a year or two, recording data that can be reduced to graphs and tabulations without even being loaded by

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What does the data in magnetic tape look like? You can't see it, but the brochure will give you an idea of what it would be like if you could. And incidentally, this may help to clarify the differences between various magnetic-tape-recording techniques.

Do you talk in tape's language? When is a tape recorder not a recorder? What is the difference between a channel and a track? What is a servo speed control? A neatly rendered glossary gives the answers to our queries on terms.

For whom did we write this booklet . . . the expert or the man for whom the whole subject is new? Both. It is written and illustrated so that any engineer or technically trained person can readily grasp the concepts and gain a broad, unclouded view of the subject. If you are one of those who has already worked extensively with tape, you will find some new twists in the way the subject is explained, and perhaps ideas on new areas you hadn't explored. And incidentally, a copy of this brochure is some handy file will give you a good start in recommending that new man in the department.



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MAGNETIC
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APPLICATIONS
BY AMPLEX

5
PAGE 100-101-102



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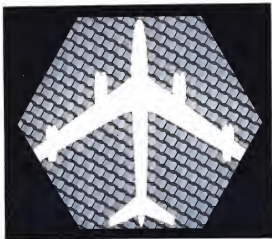
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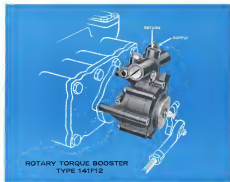


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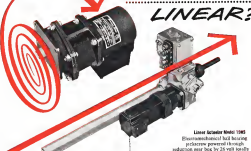
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July 8, 1957

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Vol. 47, No. 1

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Washington, D. C. 20540 Penn. Bldg., Phone: National 8-8414, Republic 7-6436
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European Office—1 rue du Temple, Geneva, Switzerland

Editorial Office

PUBLISHER Robert M. Wolfe, Jr.
EDITOR Robert S. Rich

MANAGING EDITOR William W. Jones
ASSISTANT MANAGING EDITOR (TECHNICAL)

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Grumman Transport to Roll Out in 1958 26

► Factory will deliver turbo-prop 12-passenger airplane late in 1957 for sales effort.

Smith, Noyes Detail Airline Fleet Plan 36

► Airline president says decline in profit margins poses threat to all jet financial objectives.

2-16 Fleet Transition Test to Follow 50

► Delta earlier 801 VTOL which had rotating powerplants, this vehicle uses thrust deflection.

MAJOR ENGINEERING AIR TRANSPORT

New Gas Contracts	27	Boeing Transport Proposal	31
AAE Report to NACA	28	McL. Ruling May Not Delay	39
British Air Service	105	Argonaut Split in Fleet Cost	46
		Northwest Extension Program	47
		Tokyo Area Planned by Airlines	48
		Wells Fargo Will Airlines	49
		Quick Transit for Expansion Program	49
		Airline Observer	49
		Boeing	49
		Colgate Vespene	47

EQUIPMENT

Thermal Refueling System	34
--------------------------	----

RESEARCH FINDS

Rather Power Cell Operation	127
First Steps in Operation of Paris	128
Light Bulb for Light Tube	128
Crease 3308 Chemical	128
Private Gas	128

MANAGEMENT

USA Pilot for 30 Months	39
Air Problem Affected	91
Who's Where	91
Industry Observer	91
Washington Reading	23

TECHNICAL

Test Results Will Indicate	98
Jointly Reported Air Force	23
CAA Comments	127
GAAR Comments	127
Army Comments	127
Navy Comments	127

NOTES

Transport Cars Are Dangerous	35
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COVER: Bell Aircraft Corp. engineering X-14 jet VTOL, begins flight tests. The aircraft has been in conventional jet VTOL operation but has not made a transition flight. Powerplants are two Armstrong Siddeley Vipers. Further details on p. 50.

Feature Credits:
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Transport Cuts Are Dangerous

One of the most dangerous aspects of the current administration squeeze on military aerospace is the serious slash in production of gas turbine powered transports and the virtual abandonment of any further development effort in this vital area. While the overall budget squeeze has been applied by the White House and Defense Department, the decision to make transport production and development share the meager share of this cut is a decision made by the Air Force.

It is traditional in USAF to give transports top priority on the list of things it can do without despite the evidence in the contrary provided by World War II, the Berlin blockade, Korea and Laos. There is still a quack in top-level USAF thinking that persists in the belief that the stone aerospace combination can be effectively used without an equally effective aerial logistics system to support it.

Where Ax Will Hit

The current economy ax is scheduled to make the following cuts in USAF transport strength:

- Douglas C-119 long-range transport with a 50,000 lb payload capacity. Production program will be stretched out and cut substantially despite a critical need for its logistical capacity to make more efficient use of the entire Strategic Air Command bomber fleet, from B-47s to B-58s.

- Douglas C-124 long-range transport with 108,000 lb payload capacity was dropped completely also, making the working stage.

Effects of these cuts and stretchouts if they stand as now programmed will mean major reduction in the future efficiency of combat forces, both USAF and Army. An effective aerial logistics system is a vital part of any modern combat effort, whether it is an all-out application of strategic aerospace war (nuclear bombs and missiles in the work of an international nation) or a battle requiring a head-on type of war before it can spread into a general configuration.

Jet Transport Tanker Need

Strategic Air Command has long been dependent on aerial logistics to achieve both the range and mobility required to effectively execute its global mission. It now has a huge fleet of jet-powered Boeing KC-97 tanker transports that exact a heavy penalty as operational efficiency from the jet-powered bombers they service.

In addition, SAC employs a large fleet of Douglas C-124 piston-powered transports to carry vital armor, maintenance equipment and strategic armament along with the few existing elements of its bomber needs. SAC badly needs to replace the piston-powered tanker and transport fleet with jet aircraft of increased speed, range and payload capacity. It is true that the Boeing

KC-135 will fill the jet tanker requirement, but, under the stretchout program, SAC will get them much later than it needs them.

SAC also needs a heavy load carrying capacity at the high speeds of the Douglas C-119 and C-124 piston turbo-prop transports to meet its other logistical requirements of the future. When SAC converts partially to guided missiles such as the subterranean Soviet and Russian and ballistic forces of Thor, Titan and Atlas, it will need air logistics on the scale of the C-124 to function as it.

It is utterly folly to tie the logistical pace of the intercontinental missiles to the speed of trucks that took time to haul the prototype Thor and Atlas from Southern California factories where they were manufactured across the continent to USAF's Maine Test Center as the Atlantic Coast at Cape Canaveral, Fla., where they were tested.

If the peacetime demands of the Army armed with low yield atomic weapons are to have any utility as an inter national for brigade, outgunning hostile aggressions such as the Soviet 1950 advance along the 38th Parallel before they expand into another Korea war or explode into global atomic war, they must have as transport ability at jet speeds over intercontinental ranges. Surely, if the Army is to discourage efficiency even its currently allowed nuclear prohibitions, it must have something faster than a caterpillar track to haul its Redstone and replacements for Nike Hercules but tanks.

Commercial Excuse

Some apologists for the transport slash will cite the civil transport reserve fleet scheduled to provide some 400 multi engine transports on short emergency notice and fleet transports now operated by the Military Air Transport Service as evidence that ample aerial logistic capacity is being provided. They also cite the overseas call jet transports being developed by Boeing, Douglas and Convair as an excuse for abandoning further military transport development.

Yet, they know full well that both the Civil Air Reserve Transport fleet, all transports now operated by MA1S and all commercial jet transports under development cannot meet the huge cargo, heavy payload and long range requirements of either the current or future military problems. These types can carry unexpended personnel and light cargo, but they cannot carry ballistic missiles, hydrogen warheads, exotic fuel tanks or fully equipped modern combat troops. The question is being applied to production and development of military transport aircraft will produce a serious imbalance as the future. Failure to act in this vital sphere will develop an Achilles heel of mobility, as what might otherwise be overpowering of overwhelming strength and superiority.

—Robert Holt

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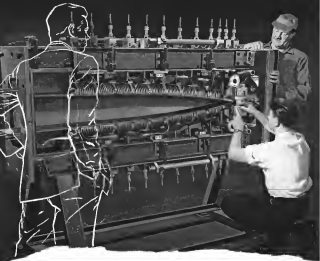


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HOW THE SILICONES MAN HELPED... CHANGE THE TUNE OF A MACH 5 WHISTLE

Race a wind thirty-six hundred miles an hour down a wind tunnel 20 inches square. Problems in testing models of supersonic aircraft and missiles in such a tunnel gave new dimensions to operational techniques.

Developed by engineers of the Jet Propulsion Laboratory at California Institute of Technology, this advanced wind tunnel presented many unique problems. In order to control the air going into the test section, movable plates were used to vary the area of the opening. The plates, moving against one another, had to be sealed. The solution created by this movement destroyed ordinary sealing materials. That is, until Union Carbide Silicone Rubber was used. Fabricated by Bussor Rubber, Inc., of San Clemente, California, in solid sheets . . . in hollow tubing

that is preformed for an extra tight fit . . . this silicone rubber performed exceptional service under almost "impossible" conditions. In fact, tests indicate that maintenance will only be required once every two or three years!

This is another example of how the UNION CARBIDE Silicone Man has helped solve an "impossible" problem. A booklet—"Look to Union Carbide for Silicones" describes silicone rubber and many other silicone products. Write Dept. AW72 today. Silicones Division, Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.



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Washington Roundup

Baker to Leave USAF

Even his ardent friends in Dallas do not know where he has found a new challenge. But Why Gen. David H. Baker, Air Materiel Command's director of procurement and production, will leave the Air Force on July 15. Described as "a great challenge man," Gen. Baker is known to have accepted an industrial job with a company not involved in aviation contracting.

Possible factor in his decision is his assignment from AMC to a new post as assistant for programming in the office of the Deputy Chief of Staff for Operations of the Pentagon. He was scheduled to take over this job next month under the new chief, Lt. Gen. William H. Tunney. There is some feeling in Pentagon and Defense circles that Gen. Baker, who had a long career as a financial and procurement expert, was being moved on his own position. His balks distinction at the time also reflect the sharp contrast a year ago when he began leaving industry about minimum requirements in facilities and programming to meet the shift from manual aircraft to missile production.

Missile 'Cognizance'

Defense Department is moving forward with its plan to put missile plants under the jurisdiction of only one service. Secretary of Defense Charles E. Wilson has told the Senate Appropriations Committee.

Steps are now being taken to place missile plants under the joint cognizance system. Even where plant cognizance has not been assigned to a single service, one service normally performs the inspection and local control administration functions for all the services having how the plant, thus insuring duplication of effort and personnel.

Wright Eyes Senate

David Wright, California lawyer and chairman of the Presidential Advisory Committee on Government Security, is among the Senate set to be named next year by Sen. William F. Knowland. The lawyer has recently released report which calls for less government services in some places, more in others, will point to his fitting speedhead. If he makes the top one of his present campaign promises will be further meeting of Californians from the government.

Many Enemies, Few Friends

Meanwhile, Committee on Government Security recommendation that persons in the government or not be subject to both fees and espionage is that make public the interests of "secret" or "top secret" disclosures (AW 17, p. 34) in finding more enemies, less public friends.

Although vigorously denied by Committee Chairman David Wright, more light is the post.

Major fault with the recommendation is postcard in some foreign quarters and other government agencies to classify even newspaper articles that have been said to be thousands of fact recognized in Wright who personally left the bits of secret last week.

Attempting to press a charge by Rep. John F. Monr (D-Calif.) to prohibit examples of alleged security leaks by the press, Wright obtained a list of 95 articles

from the Attorney General's office—most of the articles were not checked. Wright would have liked to release more but was blocked by the Attorney General's office and advisors.

The document is apparently a confidential source, with the final bits of classified material, on the bureaucratic grounds of a state of the Union.

Of the list Wright did release, Rep. Monr said: "The most charitable description of this Wright's list is that it is an interesting summary of contraband."

"It certainly is not evidence of wrongdoing on the part of the press."

In his investigation, which led to charges that in a few minutes the press had "perforated" secret documents, Wright asked the Senate Committee on Government Security to consult officials of the three services. He said that Wright's staff in large staffed by former Federal Bureau of Investigation agents.

Gen. Carl A. Mohr, Jr., Army chief of intelligence, told the House subcommittee last week that he had never heard of a case in which a reporter had "stolen" or purchased secret military information. USAF and Navy officials are expected to say the same when they appear before the subcommittee this week.

More Competition

Congressional pressure on Department of Defense to narrow the class of potential contractors in favor of non-union bidding is mounting. Senate Small Business Committee's Chairman Sen. John Sparkman (D-Ala.) made a concrete challenge with publication of a list of 567 items being procured by the military services by negotiation which he said could be procured through competitive bidding. Among the items were ships, fuel, food, medical supplies, and uniforms.

Sparkman and those are being controlled by negotiators because the Defense Department has failed to establish specifications. That, he said, "is a foregone conclusion for letting all non-union competitors bid."

During the first nine months of 1958, 93% of the number of contracts and 92% of the dollar volume of contracts let by the military services were negotiated.

Civil Air Legislation

Three civil aviation measures have moved forward in Congress.

They provide:

• **Airport Modernization Bond.** Legislation providing for the direct transfer of funds to the development of an airport modernization fund is passed by the Senate.

• **Personnel redistribution for U.S. Alaska routes.** The measure was approved by House Commerce Committee despite opposition of the Civil Aeronautics Board and Secretary of Commerce C. Douglas. Previously, it had been approved by Senate Commerce Committee. The measure directed the Alaska Airlines, Pacific Northern Airlines, Northwest Airlines, and Alaska Airlines specified that the personnel certificates should not be transferred to the Wings House for presidential approval.

• **Continuation by members of Civil Aeronautics Board.** After the expiration of their term and a successor can be appointed. This was approved by the Senate Commerce Committee in a step to maintain continuity on the Board. The measure places a restriction of 120 days on the service after expiration of a term.

—Washington staff



FIELD SURVEYS set pattern for Grumman 119 basic layout; ready availability of gross thrust turboprops dictated propeller choice.

Grumman Transport to Roll Out in 1958

Factory will deliver turboprop 12-passenger airplane
here to distributors for fitting out and sales effort.

By Kevin J. Behan

New York—Construction to develop advanced business transports to replace the obsolete DC-3 Lockheed types gained strong impetus when Grumman Aircraft Engineering Corp. revealed today that it will roll out a 12-passenger turboprop-powered airplane from its Bethpage, L. I., plant in May, 1958.

Grumman's Design 119 is the latest entry in the new class of pressurized piston, turboprop and gyro-engine businessliners being developed by Cessna, Lockheed, North American, Pittsfield, Northrop and a number of other U.S. manufacturers. (NAV July 1, p. 32.) It is also another indication of the swing toward the rapidly growing business plane field by major factories who formerly were primarily occupied in military aircraft production.

Unlike most of the other projects, which are also designed to meet USMC Navy requirements for new medium and high speed light transports Design

119 is being developed primarily as a civil airplane and will be certified under Civil Air Regulations Part C19 transport category. It will also be capable of carrying 20 passengers using high-density seating.

In addition to making Grumman's second entry into the business plane field which it left at the outbreak of the Korean war, the new venture will also be of great importance to major eastern aircraft manufacturers.

Break With Precedent

To market its new airplane Grumman will break a precedent whereby it previously sold commercial aircraft through the airlines. It will appoint distributors to handle Design 119. Representatives will be sought first covering the U.S. market, then, distributors will be selected in Canada, South America, Europe and the Australian zone, as conditions warrant.

Grumman plans to deliver to distributors a bare-bone airplane, leaving

availabilities have been tabulated. The Navy prime contractor has a reputation for building prototypes in short time from start of design and also for production runs after first flight of prototype. Usually it plans to build two prototypes to accelerate testing and certification programs, using its Florida facility for flight testing should need arise as the New York area hold up opens here.

Grumman has been discussing Design 119 with top-flight U.S. corporations ever since this war and also that response to the project has been enthusiastic. It has also developed a sales brochure outlining its project.

Bethpage, a low wing monoplane with retractable tricycle landing gear, one color fuselage and high aspect ratio wing. Design 119 will be powered by two Pratt & Whitney Dual 300A 750 hp engines having a takeoff rating of 1,105 each max. Propellers will be four-blade 11.5 ft diameter Russels.

Specifications

Design gross weight will be 31,000 lb., empty weight 12,800 lb. Maximum 12 passengers the airplane will cruise at 176 mph at 15,000 ft., at which altitude the maximum cruise will maintain regardless of 5,500 ft.

Range with 1,450 gal. of fuel, all outboard of the fuselage, will be 2,100 mi. maximum, plus common hold and alternate airport requirements. This includes 210 mi. enroute and three-quarter hour hold at 20,000 ft.

Grumman is stressing the airplane's useful requirement capability. At 11,000 lb. gross weight, the airplane designed for a CAA field length of about 4,600 ft. at 26,000 ft. it will get off under 1,000 ft. Takeoff run from a 1,000-ft. altitude report will take just over 5,000 ft. at full gross. True cruise rate of climb at rated power is given as about 2,200 fpm. at an least angle-of-climb rate of climb at about 700 ft. at this altitude.

Grumman notes that it is planning design starts into the 119 to take care of future growth of the Bethpage plant. It expects to increase the size of the engine and make it a more powerful. Price of airplane within \$1 million is expected by industry observers for the 119, but Grumman declines to discuss a figure, saying that at this stage it is too early to come up with a firm cost and that plans to distribute the airplane on a bare-bone basis, leaving the cost at present.

Wingspan will be 75 ft., just a little shorter than the Cessna 440's 79 ft. 2 in. Design 119 will be 64 ft. long and its overall height will be 22 ft. 1.5 in. Overall height will be 71 in. and length 51 ft. 6 in.

Engine and engine will maintain 17.7 m x 24 in. Airplane is designed to be self-sufficient, leaving dependent on airport facilities, particularly at off-airport points. A self-contained cabin on the left side just behind the cockpit will be operated by the pilot. Top step will single out from the fuselage. The steps leading up are possible in the fuselage.



HIGH-ASPECT ratio wings, large steps are to keep itself all short and all wings

Army Orders B-40

Washington—U. S. Army has ordered nine production models of the B-40 helicopter, now designated the HU-1. The aircraft is still undergoing tests which are being conducted with some experimental and prototype models under earlier contracts.

The first prototype helicopter, powered by a Lycoming T55 turbine engine, will be called the "hoquet" under a new Army designation under which all aircraft will be given Indian names.

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Leaving passengers traffic close of the perimeter.

An auxiliary power unit will operate on the ground operation of cabin air conditioning, radio, lights and other equipment independent of the engine.

Low Drag Control Unit Tested by ARDC

Bethpage—Martin B-57 bomber with one, started and tested wing for the study of wind and weight penalties of a low drag, boundary layer control system will be flown in Air Research and Development Command and Northrop Aircraft Inc. Results are expected to prove design of a low drag boundary layer control system.

The application, which could greatly extend the range of combat aircraft if it can be applied successfully, has been under active investigation by Northrop and ARDC's Wright Air Development Center for some years.

The concept utilizes slots along the wings, fuselage and tail surfaces. As air is sucked through the slots and exhausted over the surface, the air is kept from separating from the surface.

Theoretical analysis, wind tunnel tests and flight tests on a modified F-96 have revealed that boundary layer control is required to maintain lift at subsonic speeds.

ARDC also is studying high lift boundary layer control to aid takeoff and landings. This system either sucks or blows air at the leading edge of the wing or jet in front of the flap.

USAF Awards Snark, Nose Cone Contracts

Washington—USAF has work reported the award of three contracts to advance the program for construction of long-range missiles.

• Northrop Aircraft Inc., Hawthorne, Calif., a \$77 million production order for 3000 SM-62 intercontinental guided missiles for the Strategic Air Command.

• General Electric Co., Philadelphia, \$25 million for development work on a new nose cone for the Titan intercontinental ballistic missile and the Atlas intercontinental ballistic missile.

• Aero Manufacturing Co., Los Angeles, \$111 million for development of a new nose cone for the Titan intercontinental ballistic missile.

Announcement of the order for Titan missiles includes the official statement that the weapon has been assigned to operational units as reported by Aviation Week on Jan. 21 (p. 11). Prototype versions have been sent from the Air Force Missile Test Center at Patrick AFB, Fla.

Tax Decision Hits West Coast Industry

By Claude Witte

Washington—Department of Defense has withdrawn its assignment of tangible personal property taxes as allowable cost, leaving major aircraft manufacturers in Los Angeles County faced with a critical financial situation.

Control of allowability at this time by the Defense Department is crucial in some West Coast circles in centering on industry veterans views against those of the government policy changes handed down by the Pentagon in recent weeks (AW July 6, p. 28). The industry is not critical of the department's decision, which has a firm legal base, but is seriously concerned by the threat that a staggering amount of capital will be expended until an extended court battle can be completed.

Despite a Supreme Court decision which stated that West Coast taxes on government-owned inventory, work in process and productive equipment are illegal, Los Angeles County has appealed its use to the California Supreme Court.

At the same time, it has drastically changed its methods of assessment for 1957 so that the taxes for this year would not state those the taxes for the last previous years assessment.

Defense Department estimates it has paid about \$22 million in property taxes to West Coast local governments for the past five years. This is roughly \$5.5 million a year and would be the new assessment; previous rates would pay about four times in calendar 1957, to \$22 million each year.

Why Defense Decision

Only the airlines and remote manufacturing are involved, having been singled out by the county government, probably because they have a large percentage of federally-owned property, in their plants.

Meanwhile Defense Department has concluded it cannot pay contract taxes to reimburse them for its legal fight by a contract court. The government has held that the taxes were illegal from the time they were first levied in 1955 but continued to reimburse contractors pending settlement of a test case.

Test case filed in 1954 involved General Dynamics Corp. and August General Corp. to the County of Los Angeles. On June 10, the Supreme Court ruled the taxes illegal and said the contractors had no taxable interest in the property already paid for by the federal government.

Not only are the California counties

of Los Angeles, San Diego and Alameda continuing to assess the tax but they now have withdrawn the paying of cash for partial payments and interest credits and want an assessment of full interest reduction.

The result is that the law on test case manufacturers for calendar 1957 will be about \$6.2 million, more than the tax for the previous four years combined. Another loss, which paid about \$900,000 in 1956, will leave a tax bill of more than \$2 million this year.

A major risk is involved if any of the companies refuse to pay the taxes in government property in their possession.

If the payment is not made, pending final court settlement, Los Angeles County is free to freeze company assets, including bank accounts, and close down the business.

If on the other hand, the companies pay up their own capital in order to stay in business, they will be shouldering a serious financial burden, placing themselves in a poor competitive position relative to manufacturers in other parts of the country. On top of overall savings that the industry faces from tax cuts and previous tax breaks, they are now in a poor competitive position relative to manufacturers in other parts of the country. On top of overall savings that the industry faces from tax cuts and previous tax breaks, they are now in a poor competitive position relative to manufacturers in other parts of the country.

Tax Money Impounded

As long as the courts have jurisdiction, the tax money theoretically is impounded by the county government to keep it available for payment of the final decision in its favor of the federal government and the contractors.

In the case of Los Angeles County, however, the impounded 1956-1957 taxes were released and partially spent in 1956. After the lower court decision, the impounded was returned, and the county now is setting aside tax money at the reported rate of \$1 million a year to withhold its find and make it possible to repay the various contractors.

Actually, hardly responded for the year prior to calendar 1957 belong to the defense department in those years when the government reimbursed the contractors.

Now that the Defense Department has cut off the allowability, with contractors funds will be withheld.

Defense contracting officers have been told to make it clear to manufacturers that the government will not reimburse them for the taxes of the California Supreme Court. The county has the sole decision and declares the law is legal.

Also, the Department is directing manufacturers to file for refunds for 1954-1955-1956 taxes, which legally belong to the federal government.

Another Possibility

Another interesting possibility, at entirely remote, is that the Defense Department could now demand payment by the contractors of taxes it levied in a contract case in 1954, 1955 and 1956.

Having decided that the lower court ruling must dictate its policy from 1957 on, it could argue that the taxes collected for its legal test in the previous five years and must refund the money at once.

The Department, however, has sided with the airlines, from the beginning and still is pending guidance for the legal battle.

It is not expected to add further complexities.

IAM Drafts Plan For '58 Negotiations

Denver—International Assn. of Machinists will place major emphasis on less specific demands in 1958 contract negotiations with the nation's aircraft corporations.

- Company-wide union shop agreements as a first step towards uniform industry-wide conditions.
- Special contract provisions for skilled workers and craftsmen related to new services, including a percentage wage increase rather than a flat cost-of-living raise.
- General revision of the entire wage contract.

Extension of apprenticeship throughout the aircraft and guided missile industries through both contract provisions and efforts to persuade the Department of Defense to support approved apprenticeship training programs of all government contractors.

The four principles of attack were laid down during the sixth IAM Aircraft and Guided Missile Conference.

The delegates to the convention proposed paid leaves as decision on the amount of the wage increase to be sought because of the "hazardous" nature of "the cost of living, the extent and speed of development and the resultant conditions of the aircraft industry."

The union says it "expects" industry to put forth a plan for a shorter work week in order to speed the available work but with no increase in salaries for employees.



LOCKHEED P-104 fighters on production flight test line at Edwards Air. Defense estimate shows short-lived jet fighter. First line aircraft are production P-104As with desert ops, color add-on. Last plane is prototype without them.

Lockheed, Atune to USAF Warning, Plans Expansion Into Avionics

By Alphon W. Juep

New York—Lockheed Aircraft Corp. will expand rapidly into the military electronics business.

Necessary expansion would be supported by purchase of a suitable opportunity in aircraft. Lockheed Chief Executive Robert E. Gross said the N.Y. Society of Security Analysis last said, "But we are not going to work," he said, "We will build our own computer."

Defense requires the avionics has been under consideration for some time, but it was obvious from Gross's remarks that warnings from the Pentagon about future restrictions on military industry business (AW July 1, p. 21, 26) are producing Lockheed.

Protest Level

Emphasizing that for several years authorization for defense would not decrease but also at the present \$10 billion loss of Gross said, "There is no question that in the future there will be lower weapon systems produced by

the government's lower price contractors needed to cover the defense gap, and its greater competition."

Emphasizing Lockheed's competitive position in weapons industry was against was the risk of its losing its reputation to aviation.

"To handle these big defense orders involving billions of dollars of dollars and covering a multitude of sciences, we must broaden and deepen our competence into fields related to ours. The one I think of is cost control and control in electronics."

We said avionics companies already had a great deal of experience in having, installing, testing, and making available all kinds of electronic devices for airplanes and missiles. If that the avionics should have a stronger position in both military and commercial electronics.

"Increased strength in this field will supplement our skill and experience in aircraft manufacturing and bolster our advanced capability for weapon systems management."

Nation for a Lockheed electronics

division could be drawn out of the Nevada Systems Division, included on its staff, for example, a Loren N. Anderson, former chief scientist for the Air Force and chief of the MIT Radiation Laboratory unit.

Cutback Effect

Effects of the administration's effort to keep defense spending within the \$10 billion limit, Gross said had already been felt by Lockheed with:

- Cutback in a Navy trainer order, previously the "TV."
- Shortening of F-104 production.
- Cancellation of the WJVF order for the "true being."

No action has been made of an order, or shortening of the F-104 production program. Gross noted, Lockheed has a backlog of \$150 million for this single contract.

Whether there will be additional scheduling of aircraft production won't be known for several weeks, Gross stated.

He said he had recommended to USAF that nothing in the defense program be canceled but that everything be slowed up just a little bit to bring current spending within the limits established by the administration.

Gross attempted to still some emotion into popular conception of the

Beware of the Shark!

The nation's first intercontinental missile... the Air Force's Northrop Shark SM-42, equipped with a nuclear warhead, the Shark is a modified air-breathing missile which travels in the earth's atmosphere. Its rugged design presents a smaller target for radar, interceptors, or anti-aircraft missiles.

Extremely mobile, the Shark can be air lifted to any site within a few hours.

The plane's engine is powered by a Pratt-Witney Aircraft J-57 turbojet engine equipped with a Holley compressor bleed governor. It flies on automatic speeds above the weather even the longest range jet possible by a missile in the free world today.

Like all Holley engine controls, the compressor bleed governor is dependable, easy to service, compact and lightweight—four vital qualities for aviation equipment.

HOLLEY
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LEADER IN THE DESIGN, DEVELOPMENT AND MANUFACTURE OF AVIATION FUEL SYSTEMS AND ACCESSORIES

THIRD E. NINE MILE ROAD VAN DYKE, MICHIGAN



KC-135 Goes Into Operational Use

Two months after the first Boeing KC-135 tanker to go into operational service, was delivered to the 93rd Air Refueling Squadron at Castle AFB, Calif. Powered by four Pratt & Whitney J57 engines, the KC-135 can exceed 6000 ftph speeds and 35,000 ft altitudes, eliminating vertical fuel and time that had been required for jet bombers to perform with para-engineered tankers. Flight maintenance and crew training courses will be conducted at Castle for SAC personnel. Several KC-135s have been delivered to the Air Research and Development Command and are undergoing testing at Wright Air Development Center.





CENTER four-seat lounge has a curved side (left), and transverse bulkheads separating it from the cabin. Step-down rear lounge (right) has chairs with yellow seats, round windows, individual lights. All three lounges have yellow headrests, removable seats and large cupboards. Small bulkhead is placed between rear pair of seats in step-down lounge. Removable tables also may be installed.

How Northeast Plans Britannia Interiors

Three lounges have been designed by Northeast Airlines' line of six Bristol Britannias by Charles Beffey Associates, New York design consultants. Five enclosed planes' interior partitions reflect layout, decor and color scheme. Forward lounge accommodates eight, five center, four, and rear has room for eight. All three lounges have light yellow headrests, removable seats and large cupboards. This contrasts with the rear cabin's light blue headrests, black cupboards and blue seats and dark blue carpets.

Gold Trim

Forward lounge has a long dash of gold trim at the overhead lighting level above the white hat rack, yellow car-

pets with a reddish stripe, and decorative Polyplastic control dash leading to a forward bulkhead service area. First bulkhead has drilled bank. Removable tables may be installed between each pair of facing double seats for over-lying in seating.

Center section features a gently curved, forward lounge running front-to-rear in the plane. A semi-circular-shaped table serves its occupants. The area is partially separated from the front and rear parts of the main cabin by translucent plastic bulkheads decorated with an eagle.

Step-down rear lounge is also partially separated from the main cabin by decorative plastic bulkheads. Sidebulkhead hat rack is gold-

trimmed. Overhead ventilated Fiberglas Windows are angled colored.

Decorative motif is repeated on rear bulkhead which is of drilled bank. A small bulkhead is placed between rear pair of seats.

Removable tables may also be installed between front and rear-facing seats for passengers' convenience.

Passenger Load

Northeast's Britannias will accommodate 49 passengers: first in two-and-two, then at three-and-two seats in the forward cabin; 33 passengers in three-and-two two-and-two seats in the aft cabin; and a total, including 30 in luggage, of 42 seats.

First NAA Britannia recently flew in England (AW June 14, p. 41), but start of service may be delayed by air situation questions on landing gear.

Oral Arguments Stated In TWA Pilot Case

Washington—Oral arguments in the proceeding to suspend or revoke the airline transport pilot certificate of Leonard J. Specht, Trans World Airlines captain for allegedly leaving an assigned altitude without permission (AW March 18, p. 10) will be held before the Civil Aeronautics Board on July 17.

Both Specht and the Civil Aeronautics Board Administrators, which initiated proceedings, have appeared the examination of a panel decision. The examiner had ordered a 90-day suspension of the pilot's rating.

In the appeal and request for oral

argument, the CAA and that, although the findings and conclusions of the examiner show that the respondent demonstrated a lack of qualification to continue to hold his rating, the examiner failed to revoke the license.

Capt. Specht and in an appeal that the examiner failed to "misinterpret" and "misapprehend" the examiner's findings in the pilot's command.

The proceedings arose from an accident involving Capt. Specht, who was in command of TWA Flight 13 on route from New York to St. Louis on June 19 flying under instrument flight rules. The CAA charged that Specht was deemed to be in "distress" at 14,000 ft. but that he left his assigned altitude in order to reach 15,900 ft. and climbed through 15,800 ft. the assigned altitude of Capital Airlines Flight 14.

Capt. Specht said he had declared an emergency because of icing conditions at his assigned altitude and had requested clearance at 15,800 ft. The attorney for Specht said there was no claim during the hearing that the controllers did not receive the emergency declaration, but rather the claim is that they did not believe Capt. Specht was in an emergency.

Tokyo Runs Planned By Philippine Airline

M Manila—The four-expansion plan for Philippine Air Lines' regional and domestic operations has been submitted to the airline's board of directors by Civil Aeronautics Commission.

The program is to be undertaken from 1957 through 1959 and will be the first step toward completion of PAL's long-range international flights, announced as March 1954.

Reestablishment of flights from Manila to Tokyo is planned for October at the first step toward completion of the Japanese government of a bilateral air treaty between the Philippines and Japan.

PAL will plan to increase its weekly flights to Tokyo from the present two to about nine. Implementation of the new program will allow maximum economic utilization of the company's new Viscount aircraft, which will be used as its domestic mainline service to Manila and Davao, where new fields are currently being constructed for this type of aircraft.

PAL will begin delivery of its second Viscount aircraft.

The company will retain its Cessna aircraft primarily for use on its domestic route, but they will also be backup equipment for the Hong Kong route.

The Cessna is the only aircraft from its present 348 type to the 410 Metropolitan type.

Urban League Charges Airlines Fail to Keep Pledge on Hiring

New York—Discrimination against Negro applicants for flight jobs is behind of a pledge made last year by airlines to hire more Negroes, according to the Urban League of Greater New York. The union, all of them serving the New York area, issued a joint statement last October to the effect that applicants would be judged on qualifications alone.

Most airlines made no immediate statement that they had accepted the pledge of October, 1956, was not a change of policy, but simply a re-affirmation of stated policy not to discriminate.

The League last week said it had sent letters to presidents of the airlines and attached a report citing 46 cases of applicants denied by the League all of whom had been accepted for employment. Fourteen Negroes had filed complaints with the State Commissioner Against Discrimination as a result of their experience, the report notes. One case involving Trans World Airlines is scheduled for public hearing this week. The 1956 policy pledge, by the airlines, the report states, followed two years of intense efforts by the Urban League and others to eliminate what was always harsh and sometimes openly recognized "color" in industry both in Negroes in flight positions—despite the policy pledge—and not one Negro has so far been hired in any flight service capacity as any of the scheduled passenger airlines in the nation is expected to fly the United States.

The report notes that New York Airlines has hired a Negro helicopter pilot (New York Airlines is a scheduled passenger airline).

The League claims that J. F. Alvarez, United Airlines vice president-personnel, publicly has stated that the airlines are not yet ready to hire Negroes in flight jobs, and that H. L. Pollard, a TWA vice president, personally indicated to a Negro applicant during an interview that even if his application were entirely acceptable, he would not be hired because of his race.

Since the October, 1956, pledge by airlines, the report states, thousands of applicants had been referred by the League to TWA, American Airlines, and United Airlines. Several for pilot jobs were referred to TWA, American Airlines, Eastern, Capital, National, TWA and United. Nine were hired. Negroes selected for work as stewards and flight attendants "have been equally or better" according to the report.

The League's Airlines Committee commented in its report that "it is

difficult to avoid the confusion that all of the scheduled airlines of the United States are continuing, in concert, to maintain the rigid ban on the employment of Negroes in all flight capacities." The next step is up to the airlines.

American Airlines said it had hired two out of every 100 stewardess applicants interviewed during the last year and that on a purely statistical basis it was impossible to tell if the two Negro applicants the League said it referred to Americans would have qualified. Like other airlines checked by American Writers, Americans and its flying policies were based on merit alone and other examples of Negro applicants in many jobs within the airline.

High Speed Blamed In TWA Accident

Washington—Investigators spent during an emergency approach contributed to the crash of a Trans World Airlines Martin 404 at Las Vegas, Nev., last Nov. 15 the Civil Aeronautics Board ruled last week. The captain, lieutenants and 14 of the 35 passengers received only minor injuries although the plane was damaged beyond repair.

The crash occurred off from Las Vegas on route to Los Angeles when the engine hit power and the propeller was feathered.

The flight returned to the airport and continued by making a normal approach to the runway.

The CAA's accident investigation report said the flight entered the clouds, field with excessive speed and forced a 270° left before touching the runway. A series of bumps occurred as the aircraft attempted to make a forced landing into the runway.

Believing the aircraft could not land, it was forced to make a normal approach to the runway.

The Board determined that the probable cause of the accident was that in an emergency situation the captain failed to reduce speed during the latter portion of a single engine approach. The engine speed resulted in an excessive stall as the aircraft approached the runway.

The Board also said that prior to the accident, company pilot training with respect to the performance of the Martin 404 in the limited landing situation was found to be inadequate.



FORWARD lounge has eight seats. Forward bulkhead, curved side, yellow seats and large cupboards. Small bulkhead is placed between rear pair of seats in step-down lounge.



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Ozark Primes for Expansion Program

By Craig Lewis

St. Louis-Ozark Air Lines is in the midst of a costly expansion program which has seen the local airline reorganize service on five new routes in the past two years.

Applications are now before the Civil Aeronautics Board which would add significant new routes to the carrier's system as a program designed to develop its Mid-Western territory.

In serving these expanding markets, Ozark is concentrating on the basic operating factor of reliable, on-time service in competing with both trunk airlines and some highly competitive airline transportation.

Like all other local airlines, Ozark relies on the DC-3 to provide this service. Unlike many other local carriers, Ozark has not ordered new equipment to replace the DC-3.

One of the concepts of the local service airlines, Ozark started operations in 1918. Since then, the carrier has moved up among the top half dozen local carriers in terms of traffic and revenues.

Feeder Lines

Ozark Air Lines was incorporated in 1915 to operate as a feeder airline, but authority didn't come from the CAB until 1950. At that time, the carrier took over Delta Air Lines and its system, and started service between St. Louis and Chicago via Springfield, Kansas City and Chicago/Ohio. (It, Chicago is still Ozark's best traffic point.)

Two years ago, Ozark began serving a whole series of new routes. In May 1955, service was started between St. Louis, Keokuk and Nashville. Then, in August, 1955, between Chicago and Sioux City, Iowa. In October, 1955 between Fort Worth and Lawrenceville, Ky., and in June, 1956, between Fort Worth and Des Moines, Iowa.

Latest service began April 26 on a new Memphis route to Minneapolis. St. Paul route which adds the Twin Cities to Ozark's collection of substantial midwestern public markets. For months of operation indicate the latest route will be one of the carrier's strongest segments.

Addition of these routes has helped Ozark jump its traffic from a total of 156,181 passengers in 1954 to 247,531 in 1955 and 313,948 last year.

For future growth, Ozark's main interest now lies in the Seven States Area. In this area, the carrier hopes to stretch its routes west to Denver and add such points as Omaha and Cheyenne to its routes.

Ozark would also like to go to such



MID-WESTERN markets are served by passing Ozark Air Lines with DC-3 equipment.

new markets as Tulsa, Knoxville and Cincinnati. And the carrier would also like a route link between Milwaukee and Chicago to improve aircraft scheduling in that part of the system.

Generally, none of these proposed routes requires overlap between carriers of other local airlines. That is because Ozark doesn't believe local carriers should compete with each other.

Overlapping

Ozark's President Laddie Henshaw told Aviation Week that there's local airlines "and we don't" when they start overlapping routes and competing with one another. He believes it would lead to confusion in the already heavy schedule now paid the local service airlines.

Ozark hasn't decided which transport it will buy to replace its DC-3s, but Henshaw says the new aircraft will be turbine-powered when the decision is made. Right now, the Fairchild F-27 is the "Number One prospect" in Ozark's view, but other aircraft are also in the running.

William Armstrong has produced an extensive study of Ozark's system in planning the Vancouper, and the carrier has hired Paul Anderson's job as the Controller. The Henshaw Page Henshaw is another competitor. The last decision depends somewhat on whether the CAB decides to let any of the local

airlines' various route restrictions. Henshaw feels that Ozark will continue to operate DC-3s on some routes even after a new airplane is required, and he says the carrier will probably buy more DC-3s if its route applications are successful.

In an effort to improve its present fleet of 70 DC-3s, Ozark has launched a modification program to improve DC-3 performance. The end-product of this modification program called Challenge 27Bs began being on the carrier's system over a year ago.

The modification program gets its biggest performance gain from new wheel-well doors developed by Pan American World Airways at its Brownsville, Tex. base. A new oil cooler scoop also helps reduce drag. Ozark performed these modifications at its St. Louis base.

The airline also cleaned up the DC-3 exterior by installing flash-rubber compass assemblies. The DC-3s used by Aircraft Conversion Corp. in Detroit to hang Ellor fusings and streamer gap covers.

In the future, Ozark plans to add new engine mounting and baffling developments by the Boeing Co. The future will be partly exhaust stacks. The Challenge 27B primarily has short wheels.

When all modifications are completed, Ozark expects its DC-3s will be 30% more efficient. Airport gates in

PLANE FAX

by STANDARD OIL COMPANY OF CALIFORNIA



300-mile flight wins \$1,000,000 job

Two hours before the deadline for placing bids on a million-dollar Nevada State road maintenance job, A. D. "Andy" Brown Jr. took off from his home airport at Fallon, Nevada. In 3½ hours he had covered 300 miles down over the desert road site to estimate the work involved, landed at Carson City and placed the low bid. "Heavy low level flying, frequent takeoffs from grass strips, steep climbs to beat weather — we do it all," says Mr. Brown, who is owner of the Silver State Construction Company. "But in several thousand hours in the air, we've

never had any engine trouble, using RPM Aviation Oils. In fact, we usually get 1000 hours on a plane with only engine maintenance, then trade it in while it's still in top condition. When we do overhaul an engine, we've always found 'RPM' has kept it clean and built was very low. "This lets us get full power from General Aviation Gasoline right up to twelve thousand feet. Even so not enough, short stops it gets our business and AT-5's operators with plenty of room to spare. Lessen out fuel economy is amazing, too. It's the best fuel we've ever found."



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TIP OF THE MONTH

With so much flying in Nevada's hot/dry air, Mr. Brown's planes are equipped with General's Blue advice—also shown when lamps register 2 or 3 means 1 G's or whenever it gets really rough.

estimated at about 35 mph, but right now the carrier is taking all its gains by operating at normal DC-3 speed with reduced power because of new pay demands made by Decca pilots on the basis of increased speeds.

Discussing the local airline industry's unique problems, Hamilton and these are three solutions:

- New equipment to replace the unimproved DC-3.
- Greater operating flexibility from the CAB so carriers can operate more profitable morning, long haul flights.
- Strengthening of route structures by the CAB.

Hamilton feels that local airline firms are inherently to cover cost increases. He points out that local firms are not to make gains, and that if the trucks are successful in their efforts to raise fares 65%, the local airlines will follow that he also points out that even 65% won't cover the situation long because of continuing rising costs.

Six Eastern Nations Can Handle Jet Liners

Washington—Plans and reports in six Far Eastern countries will be able quickly equipped to handle jet trans port operations within the next two years, according to Joseph H. Toppin, director of the Civil Aviation Administration's Office of Air Navigation Facilities.

Toppin has just returned from an inspection tour of Formosa, Korea, Thailand, Viet Nam, Japan and the Philippines where he made a detailed survey of airport and airport development. The CAB has an average of five airports listed in each of the countries except the Philippines.

Toppin and extensive landing gear, VOR facilities, high-density, approach lights, and non-directional beacons are being installed throughout the area to conform with International Civil Aviation Organization standards. The CAB is packaging the equipment with funds provided by the International Cooperative Administration under a CAA technical assistance program.

The CAA official said surveys of airports around the capital cities of the eight countries are now being prepared in that length and width will determine date for transport scheduled over present airline routes.

Toppin and the major aim of the assistance program is to bring standards in the construction and use of the equipment and added that "it is the CAA policy to support and demonstrate such as to give the national a chance to develop technical competence through experience as well as training."

AIRLINE OBSERVER

U. S. delegates to recent London talks on the proposed British-U. S. bilateral agreement lost some of their negotiating power as a result of sharp British criticism of the Civil Aeronautics Board's refusal to approve an International Air Transport Association proposal for a 5% increase in transatlantic fares (AW June 10, p. 41). For the 1965 fare year March, 1956, the U. S. tried to obtain operating rights for Trans World Airlines between Frankfurt and Paris to close the carrier's European route gap. Although the talks were originally held on "exploratory" and not to formal discussion, it is understood that plans for further negotiations have been deferred as a result of the failure to reach any accord on the agreement.

Civil Aeronautics Board hearings began last week on Second Air Carrier Modification's application for a foreign and carrier permit to operate scheduled service over those routes from Colorado to New York and Montreal, to Miami and New York and to New Orleans.

Airlines last week implemented plans for flying under instrument flight rules clearance at 9,500 ft or above on the "gullies" routes between New York, Washington and Chicago (AW June 17, p. 45). Both the Air Transport Association and the Air Line Pilots Association plan to lower the floor altitude progressively as the air traffic control system expands, increases. Airlines are now voluntarily operating all flights above 16,000 ft throughout the U. S. under IFR procedures to maintain positive separation of aircraft. Civil Aeronautics Administration has established 20,000 ft as the floor for positive control of aircraft under all conditions.

Amendment to International Air Transport Association request for resolution permitting the application of a 40% rate discount to carriers from Spain has been approved by the Civil Aeronautics Board. An earlier resolution calling for the discount applied to all European carriers except those from Italy and Spain.

American Airlines action for "expedition service" as its application to provide expedited service between New York and San Francisco has been denied by the Civil Aeronautics Board. CAB staff however, has been directed to review the problem of the air service pattern between New York and San Francisco and to report the results of the study to the Board on or about Dec. 1 to determine the need of an early leaving as the nonstop service route.

Hawaiian Airlines request for an exemption to permit the issuance of free transportation to one hour conductors accompanying 15 or more persons traveling as a group between points in the Hawaiian Islands on an scheduled tour has been denied by the Civil Aeronautics Board.

Reduced railroad fares for military personnel traveling in uniform on their own expense have been extended to June 30, 1955 but not beyond the previously scheduled expiration date.

Alaska Airlines has joined the ranks of Local and Territorial Airlines in being the membership of the new group to join. In addition to the six local carrier members who split with the Local Airlines new policy station (AW April 1, p. 38), membership includes Alsea Alaska Airlines (Alaska) and Trans-Pacific Airlines (Hawaii).

Continental Division of General Dynamics Corp. has delivered the 1,800th transport it has produced to Eastern Airlines. Customers have received 500th, 100,000th in the Convair 440, 140 and 240 transports, the first of which was delivered in February, 1948. Fourteen domestic and 15 foreign airlines have purchased one or more of the three conventional versions of the two-engine transport.

Australian government has approved the recently negotiated bilateral agreement with the U. S. granting Qantas Empire Airways operating rights between San Francisco and New York and beyond for air around the world route. Next step is to complete the operational details of a formal exchange of notes between the two governments to ratify the details.

THE RECORD-BREAKING VISCOUNT



TCA reports...

61% TRAFFIC INCREASE WITH VISCOUNTS!

In the first nine months of 1958, Trans-Canada Air Lines' New York-Canada traffic rose 61% over the previous year—thanks to the Viscount Viscount.

The tremendous passenger appeal of the Viscount was evident from the very beginning. In the first full year of service, Trans-Canada Air Lines' total Viscount operations achieved a passenger load factor of 80%, and its increased over 85% for more than two years of service.

Mr. Gordon McGregor, President of TCA, declares that,

in his opinion, "the Viscount Viscount is by a very wide margin the best commercial aircraft of its class that has ever been built." He adds that thanks to the experience and traffic viewpoints, Viscounts "proved the most modern, most efficient aircraft." As a result, TCA has ordered a total of 16 Viscounts.

Similar popularity is reported by all the 14 other airlines now flying the Viscount. "These experiences prove up to the 'superior' the Viscount from traffic figures alone."

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SHORTLINES

► **Australia Airlines** will begin the first weekly service between Boston and Los Angeles on August 1 with Douglas DC-7s. C. K. Speer, senior vice president, points out the service will not necessarily traveling between the West Coast and Europe. No option of connecting at Dallas rather than at another East Coast city, with apparent savings in time in many instances. The airline also has completed a quarter-century dollar anniversary of its passenger facilities at LaGuardia Airport, including doubling the space in ticketing and gate areas and installation of a self-clear baggage system. The last will be used until completion of the Port Authority redevelopment program at LaGuardia.

► **Elmer Aero Industries (EAI)** and Seaboard & Western Airlines have signed a cargo satellite agreement permitting air cargo to fly over Seaboard's and EAI's routes on one service bill.

► **Northeast Airlines** has inaugurated two services on its New England routes. The first three direct flights daily from Philadelphia to Martha's Vineyard and Nantucket. The second originates in Washington, it bypasses New York and continues on to Buzzards Bay, Martha's Vineyard and Nantucket. The second-a nonstop flight from New York to Portland using Douglas DC-4s. This also is on a three flights per day basis.

► **Aerolinea Colombiana Nacional** Airlines will begin first direct flights to Bogota, Quito and Lima on July 5. First time the capital has been linked by one or more direct from New York. The service, operating on Tuo-tuo and Stradivari, will stop only at Panama. At the same time, Aerolinea will move the western terminus of its European service from Bogota to Lima, providing Quito with the only air route port service to Paris and Frankfurt.

► **United Air Lines** has expanded its Douglas DC-64 air cargo service to Boston and Hartford-Springfield. The new service provides scheduled flights to the Atlantic via Cleveland with connections in Chicago for company service to California. New enhanced service from California to Boston now also begins on July 1 with one weekly stop at Cleveland and New York.

► **Central Airlines** has suggested passenger service to Houston, Ark., as a new stop on the Fort Worth-Dallas to St. Louis route. The Houston service belongs to 12 the number of cities served by Central.

COCKPIT VIEWPOINT

By Capt. R. C. Robson



State of the Weather

A study of available weather reports and forecasts generally provides a pilot with a fair idea of the meteorological possibilities which his flight may encounter. These possibilities are, however, known to vary from one section to the other, in the way pilot cannot possibly be most accurate.

This does not mean that today's meteorologists are not doing a fine job. They are and we need more of it. But don't conditions in the sky are not always as advertised. How can we do better?

On some routes, especially routes which have a high frequency of operations, the pilots run their own flight advisory service. For instance, 28 or 30 minutes out of Washington I can talk to a top over New York at 14,000 ft., a local port north of Philadelphia and, if desired, flights in the vicinity of Hartford, Albany or Boston. The extent of this exchange of information depends on the need. A wealth of data is available including reports and estimates of visibility, wind, turbulence, icing, the location and movement of rain showers and anything else needed.

Obvious Benefits

The benefits of such a system are obvious. Not only is safety increased, but we are able to provide a more pleasant ride for the customer as well as operate a more efficient flight. It would be wonderful if all pilots in the area could share in these reports.

Here, at least, is the point of the column. The U.S. is blessed with accurate data and flight. Put your finger in a map and choose one that is regular in close by with the pilots usually use the weather. What could be more exact than a system based on reports from those on the spot observer? It is possible for a pilot to state that the aviation business would not be the only one to gain from such a plan.

Once upon a time there was a belief in a so-called circle that passengers and pilots would share. "In the weather," flying in an actual local area. For obvious reasons the belief was shattered. Supercharged engines and pressure systems certainly do allow more latitude in choosing the flight path but we have not yet seen it. With such resources as we have, we can do more to meet new problems.

Greater Demands

Within a few years air transportation is apparently going to fly even higher than it does now, and at considerably increased speeds. If anything, this sets a requirement for even more detail about weather conditions than pilots want to know the exact direction and velocity of upper winds, the pressure levels of the jet stream, whether there are turbulence areas and where, what they are and what they are and many other things. Forecasts, while useful, will not satisfy the urgent need to know what is happening right now.

Obviously, when we feel this way we find that we are talking about a considerable problem. The situation can not be achieved on today's meteorological reports. On the other hand, the need for an up to the minute, in-flight pilot advisory service in a real one and some steps might be taken now towards the organization of a centralized weather reporting system.

I cannot wait to know what's ahead so that I can plan accordingly. I report my passengers would like this also. Jet flights would appear to gain considerably from this data. Quite properly, I suppose, the GAA might initiate exploratory talks on this subject once someone is really interested in it. Many pilots, airline, business, private and military feel that this would be a worthy field project. Who knows, we might even know what the weather is now day!



9 out of 10 U. S. military jet pilots were trained in Lockheed jets.

9 OUT OF 10 U. S. MILITARY JET PILOTS WERE TRAINED IN
LOCKHEED JETS. THE NAVY'S NEW T2V-1 "SEASTAR", BUILT
BY LOCKHEED'S CALIFORNIA DIVISION, IS THE FIRST U. S.
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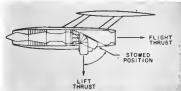
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X-14 makes conventional flights with the exhaust jets of the two engines, directed upwards and VTOL flights with the jets directed downwards. It has not yet performed its eighth transition. Sixth air starts at wing tip and tail on its slow speed control. Descensions are 14 ft, length 21 ft and height 8 ft of tail. Total weight is probably just under the 1,500 lb maximum thrust of the engines minus any towing losses. Fuel tanks are fixed under the wing in a matrix of cross-sections, they are not droppable.

X-14 Flies; Transition Test to Follow



DEFLECTING intake was prepared by Bell designers, the late Robert Woods, in an SAE paper. Although a Bell spokesman insists with the X-14 has proved that the idea does not decline the most serious of the jet engine design used on the X-14, the drawing does indicate how Bell might do the job on a future jet VTOL. Design used in the restricted space on X-14 could very likely be a series of cascade turning vanes. Such a device has features in common with thrust reversers and, like them, has the practical problem of rotating and sealing a device which must work in the hot exhaust gas environment. If afterburning were used, the problem of nozzle area and fuel control would be added.

Bell aircraft's X-14 jet VTOL has successfully completed initial flight tests, short flights in both conventional and VTOL regimes. Next step will be transition from VTOL to conventional flight and back.

The Bell USAF sponsored X-14 is a closed up version of the wheels Bell sponsored VTOL down in 1914. Instead of badly rotating the engines as on the first VTOL model, Bell has the jet engines in the X-14 maintained level and their exhausts are deflected down for vertical flight.

Viper Powerplants

The X-14 is powered by two Armstrong Siddeley ASV-8 Viper turbojets producing 1,750 lb thrust each. Special vanes in direction bend the two jet exhausts downwards.

When a safe altitude is reached by the aircraft the vanes are "slashed" to direct the jets upward for conventional forward flight.

During the vertical and transition



TEST PILOT David Howe made the first X-14 hovering flight. The exhaust jets of the two side-by-side Viper turbojets are located as the center of the triangle formed by the red balance warning bar around the fuselage and the two main wheels. The exhaust jets and their deflection mechanism are hidden from view by the fixed tail fin, being below the wing. Long legs of the landing gear maintain the ground reference on the exhaust jets.

flight periods, aircraft control is effected by three jet jets, one at each wing tip and one at the extreme tail.

In design the X-14 appears a natural evolution of the first Bell VTOL experimental aircraft now in the Smithsonian Institute, Washington, D. C. That design used two Fairchild J44 engines in rotating "chassis" to lift and propel an airplane made up of a Sabotier glider fuselage and a Comac 130 wing.

The new aircraft has nearly twice the weight of the first VTOL, 3,500 lb against 1,800 lb, and has a much more finished appearance. X-14 is still a low speed test vehicle, high drag of the cascade indicates that Bell and USAF are only interested in keeping some short VTOL and transitional flight rather than exploiting the high speed potential of the design.

Because the Vipers have a thrust to weight ratio of about 3:1 and a SFC of 1.7 against the older J44's thrust to weight of 2.7 and SFC of 1.55, the X-14 is able to stay aloft about 30 seconds.

After composed in the 10:12 minute here accomplished by the first VTOL.

Ultimate foreseeable vehicle of this type would use turbojets of the new lightweight class as the Fairchild J44 in General Electric J45. The more advanced J45 and J45 engines are expected to have thrust to weight ratio of 3:1 and SFC as low as 1.0 and therefore, ought to provide better vehicle of this type with duration of up to one hour.

Labor Engines

If the afterburning versions of these aircraft engines are used, Bell engineers believe that it might be possible to design a responsive responsive NATO type airplane having VTOL capability.

In a paper presented before the Society of Automotive Engineers over a year ago, the late Robert J. Woods of Bell described (among other Bell VTOL interests) a jet transport which would use the deflating tailpipe principle. The configuration he described was expected

to be good for supersonic speeds up to Mach 2. An internal tailpipe he says the jet engine and horizontally fixed afterburner was pointed down for the VTOL lift off.

Once airborne, this short internal air tailpipe was turned back to line with the conventional afterburner for Mach 2 forward flight.

Woods said that while the lifting nozzle might use an afterburning for take-off, VTOL, landing probably could be accomplished without afterburning since the fuel had would have been ignited.

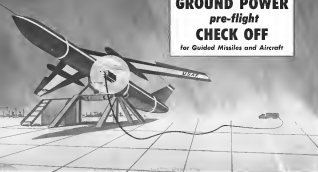
The two-engine transport envisioned had a 4,000 lb payload and a range of 800 miles. It was expected to have a forward hovering altitude of 6 feet.

Because nonconventional landing gear was omitted, the transport operator would have the option, if space permitted, to use a single (or other) catch gear(s) by using a rolling take-off. In Woods' example a 5,500 lb ground use powered 30,000 lb area

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Cole 60 KW
400 Cycle, 3 Phase
Electrical Substation

and of fuel to be burned, meaning the range is 1,500 miles.

The X-14 was designed around the practical necessity of keeping the vertical thrust vector through the aircraft center of gravity at the one fourth wing chord. This meant that the integral exhaust had to be bent sharply down just after they left the engine.

Several sheet metal ingots shown in the test vehicle. What is left is a simple open container with no attempt to lay flat into the fuselage. First fuel tanks are slung under the wings simply because this is the easiest place to attach them for stress and yet keep their wing load centered at the plane's center of gravity. Final landing gear is used rather than the retracting gear that will be mandatory if this type of vehicle is to achieve its design speed potential. The engine thrust can only be rotated partially upwards if it were fully horizontal it would burn up the underside of the fuselage.

Low Speed End

None of them, engineers were considered detrimental to X-14 objectives further exploring the low speed end of a high speed VTOL aircraft.

The six jets for low speed control on the X-14 are perfectly identical with those tested on the first Bell VTOL. They are the same 15-45 lb thrust turbo jets built-in with the corresponding altitude, attitude and elevator controls.

In the first VTOL, it was found that the pilot could maintain control in hovering and vertical flight without additional stability (bearing gyro loaded with an electronic compass) if he used rapid "yaw-out" stick motions. Because the mass of the X-14 is greater than the first VTOL, it is mandatory that the pilot maintain the response laglessness with those of the aircraft.

Another advantage of the X-14 over the earlier design has been that the fixed engines in their conventional position do not produce disturbing gyroscopic forces. The gyroscopic forces from the horizontally disposed Vernier engines on the X-14 point in such the opposite way from. In the first VTOL, during VTOL operations, the two H-14 rotors were vertical and gyroscopic coupling produced a roll moment which was counteracting to the pilot.

Roll did not decline whether no aerodynamic compensation was used to supply the response for the control jets or whether the control jets was blown out of their engine compartments.

On the first VTOL, a small Valvacore subcomparator was used in the source of control as

Though the newer design keeps the engines close together, it is difficult

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if not responsible to maintain control in VTOL with one engine out, ensuring that enough fuel were burned to permit the thrust of the single engine to support the plane.

Bell then incorporated attribute VTOLa because they are closer for the pilot to "see it" on a small landing spot since they automatically feathered into the wind and are not as susceptible to cross gusts as a tail rotor would be.

The Bell type is also easier to service without special rigs.

The Short SC 1 in Britain (AW Jan. 7, p. 30) is another test vehicle built around that principle. The Short

Brother's aircraft uses five Rolls Royce engines of similar design but probably of much lighter weight.

Control is also with dual jets located at engine automation (AW Jan. 7, p. 30).

VTOLa take-off procedure at Bell has been to load the vehicle with fuel until it weighs as much as the combined engine vertical thrust, then to run the engines up and let the vehicle rise vertically as it burns off fuel. On the first VTOLa, Bell tested rate of vertical ascent to 5 ft.

Dimensions of the X44 are 36 ft wing span by 25 ft length and 5 ft tail height.



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Douglas Will Modify B-66s at Tulsa Plant

Program to modify more than 100 Douglas B-66 twin jet bombers under a contract awarded by the Air Force will help stabilize employment at the Douglas Tulsa, Okla., plant where the work will be carried out.

Workload at the plant, where the C-412 transport project was under way, is currently about 7,700 and the program will help to keep it at this level. The C-132 was one of the early orders of USAF fund tightening.

The B-66s will be flown from the Tulsa Air Command Base in Tulsa for inspection, repair and modification to latest combat configuration. The program will continue into 1974.

A R-77 IRAN program has been under way at the Tulsa plant for the last four years.

Civil Air Program Outlined for Britain

London-Government civil aircraft planning under the new company program has been outlined by Minister of Supply Anthony Jones.

Civil aircraft program must be stepped up to reflect the cutback in Britain's military aircraft requirements, he said.

The minister expects that the Vickers VC-10, ordered by British Overseas Airways Corp., will enjoy large export sales. In addition, he indicated government support for those future British developments.

- Medium range jet for British Overseas Airways
- British aerospace industry which is considered a "major" export
- All British helicopters.

And in the field of smaller aircraft, "we as Britain are well placed to supply the growing market in these throughout the world and particularly in the Commonwealth."

Military aircraft cutbacks were inevitable, he said, because too many military projects had expanded the industry to a level which could not be indefinitely sustained.

He urged the industry to increase self-reliance, but suggested certain fields in which government help can be expected.

- Fundamental research, which he said, is beyond the scope of any individual company. There is no alternative to its being continued under government sponsorship.

• Civilian work is recognized for the government to coordinate its military demands for transport work with the demand of BOAC and BEA for civil aircraft.



The Zumwalt single launch area at NOTES test facility is considered the largest "missile pit" in the world. Experimental missiles are thrown into the water through a 300 foot long launching tube.

NAVAL ORDNANCE TEST STATION DESIGNS, DEVELOPS, TESTS ADVANCED WEAPONS

Serving the needs of the fleet and other service branches for aquatic weapons in the mission of the Navy's largest ordnance research and development center, the U. S. Naval Ordnance Test Station (NOTS) at China Lake and Pasadena, California.

Established in 1943 by the Bureau of Ordnance, NOTS is the "home" of weapons such as the 2.75" MIGHTY MOUSE air-to-air rocket and the recently unveiled HIDEWINDER guided missile. These weapons are products of an effective military-civilian team at NOTS which originates and carries out weapon ideas, designs, developing, and testing guided missiles, rockets, torpedoes, autonomous-control systems, and other ordnance items until they are completed and ready for mass production. Many specialized facilities enable the Sta-

tion to perform this broad program. Among these are highly sophisticated test ranges, transmission and experiment test tracks, facilities for the development and pilot production of solid and liquid propellant, a missile test range equipped with gloves of many types, a sophisticated radio research and development laboratory, and other installations.

The main facility at NOTS encompasses over 3,200 square miles of the Mojave Desert 125 miles north of Los Angeles, while underwater ordnance activities are centered at Pasadena, with water test ranges located at Marine Corps, Long Beach, and San Clemente Island. About 4,000 scientists, engineers, and other personnel, and 1,200 military personnel at NOTS installations are constantly working to develop better weapons for our nation's defense.



This is one of a series of ads on the technical activities of the Department of Defense.

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RUSSIAN DRAWING of Mil-1 interior. The numbers indicate: 1—main 1-rotational stick; 3—nose wheel; 4—throttle and pitch control stick; 5—pilot's seat; 6—passenger frame; 7—engine; 8—main (vertical) shaft; 9—axis; 10—main landing gear wheel; 11—tail shaft; 12—tail for lower shaft; 13—tail boom; 14—tail shaft; 15—rotors; 16—tail support; 17—tail reduction gear; 18—tail boom; 19—main reduction gear; 20—blades of main (tail) rotor; 21—blades of tail rotor; 22—driving column; 23—main reduction gear; 24—drum for blades of tail rotor; 25—hub for tail rotor; 26—main rotor (visible) plate; 27—oil tank; 28—axis for coupling clutch and for braking.

Russians Detail Mil-1 Flight Handling

Secret aviation sources have reported observations with the result of a helicopter available for piloting. To correct this deficiency, the magazine *Kosmos Rodina* (Wings of the Fatherland) has begun a series of articles on flying the Mil-1 helicopter. The first, on ground handling, was written by G. Tsvetkov, one pilot for class.

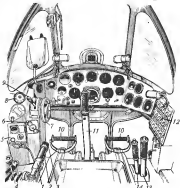
It has been translated by *AVIATION WEEK*, and is being reported in condensed form.

Helicopters have recently been used in our work with air control. The helicopter encountered more often is the Mil-1. When equipped with dual controls it is also used successfully for training flight personnel.

It is known to me that the Mil-1 helicopter has been modified several times. Thus, for example, the color dimensions have been changed, color control levers have been transposed with various accessories, a stabilizer with a variable tilting angle has been installed, the oil system for the main reduction gear has been substantially modified, and so on.

INSTRUMENTS

The pilot's seat in the Mil-1 helicopter is located in the front part of the cabin. In this machine's passenger version a chair for the passenger is installed behind the pilot's seat. In



NUMBERS in diagram identifying cockpit layout are described in following by pilot



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the trailer version, the instructor's seat with a second set of controls is located behind and to the right of the pilot's seat.

At the left, alongside the pilot's seat is a combined control stick for engaging the pitch of the lifting rotor and the engine air load—the so-called pitch/throttle (collective) stick (Number 1 in cockpit drawing). With the combined control, the revolutions of the engine and of the lifting rotor remain perfectly constant at all engine, speed and altitude of flight. Disturbance in flight of ascending maneuvers engine revolutions and momentary revolutions for the lifting rotor are absorbed completely.

The collective pitch stick has a mechanical catch which allows the stick to be fixed securely in any position. This is necessary during long flights, when it is necessary to maintain a given engine operating regime. In this case the stick itself can be used as a support for the pilot's left hand. On the upper end of the stick is a rotating throttle grip (2) which permits a reduced engine revolutions setting when the helicopter is flying on-come-possibly a takeoff revolutions setting during takeoff at a fixed engine regime, and also permits maintenance of the required revolutions during flight at different altitudes.

The indicator on the stick knob (3) of the throttle grip revolves with the grip and enables the pilot to determine its turn not only visually, but also by touch. This is especially convenient during night flights.

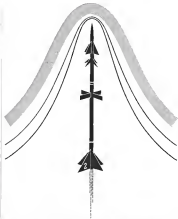
The combined control (collective pitch and throttle) stick is also connected with the helicopter's movable stabilizer which is provided to improve longitudinal stability.

Cockpit Layout

On the cabin floor, alongside the collective pitch and throttle stick, are the oil and fuel cocks. The oil cock is used to prevent flooding the engine with oil, since the system is located above the engine. The cock is interlocked with the engine system so that as long as the engine is running, the oil cock is closed and oil is impossible. The first cock, as on an airplane, is necessary to stop the flow of fuel to the engine in case of fire and also while the craft is standing or undergoing repairs.

Alongside the cocks are two levers (4) for regulating the valves for cooling the engine cylinders and oil. To open them, the pilot should push on the knob of the lever (to release it) and then move it forward. The required temperatures for the cylinder heads and oil are maintained in accordance with the opening of the valves.

On the lower part of the cabin's left



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Navy Puts F8U Through Carrier Shakedown Trial

Center landing and takeoff techniques for the Chance Vought F8U Corsair were developed aboard the Franklin D. Roosevelt by VC-13, seven pilots and six Corsairs made 150 sorted and touch-and-go landings on the carrier's angled deck using the mirror landing system (below and right).

Tracked by its shadow on the deck, one of the F8Us takes a wire off (left). "Snatch" wires from tailgate air alternators is set in. Awaiting look from F3U (below) is coupling wire.

Glows from green lights are horizontal bar of mirror landing system (below, right) indicate a safe approach. Red lights on vertical wire track to signal next off.

Chance Vought recently received a \$34 million Navy contract to continue development of successor F8U-3. Grossman T-11F Tiger also being qualified, is visible (center opposite).



panel for the control panel for the radio compass (5) and for the radio (6). In the upper part of the left panel are the circuit breakers for regulating the longitudinal (7) and lateral (8) "transmitter" and the altitude correction factor (9).

It should be kept in mind that the M-1 helicopter is not equipped with a radio compass (radio compass) like most airplanes but with spring-driven which provide a change in the forces on the control stick.

In the center section of the cockpit, in front of the pilot's seat, there is an instrument panel, on the left-hand section of which are the pressure gauge, the altimeter and the engine starting button. In the center section of the instrument panel are the firing and ammunition instruments of conventional (conventional) type.

As differentiated from an airplane instrument panel, the modified pressure indicator and the engine revolution counter are installed in the group of firing instruments. This is the result of the possibility of piloting in helicopter and also because of the possibility of using these instruments as revolvers (alternatives) during blind flying.

Two Needles

Despite the fact that the M-1 helicopter has only one engine, its stroke-counter has two needles. The needle with the letter M shows the engine revolutions, and the needle with the letter R shows the revolutions of the lifting rotor.

As is known, the revolutions of the lifting rotor are less than the corresponding revolutions for the helicopter's engine. If the revolutions for the engine and the lifting rotor shows (indicates) each other, it would be possible to get along with a single-stroke revolution counter. However, owing to the fact that there is an engaging clutch and a free-wheeling clutch in the transmission between the engine and the lifting rotor, the revolutions of the engine and of the lifting rotor sometimes can coincide.

When gliding in an instrument panel, especially during training in practice, it is very important for the pilot to know whether the engine revolutions match the revolutions of the lifting rotor. In the past, when the helicopter's instrument panel had two indicators with different markings, it was difficult to determine the beginning of the lifting rotor's introduction. The two-needle revolution counter, which has two markings for engine revolutions, considerably eases the task of checking on normal operation of the engine and the lifting rotor both on the ground and in flight.

Below, under the instrument panel,



Polish Helicopter Hub Details

Rotor Hub for Polish SH-1 helicopter shows design details of the four-blade layout. Lines for liquid driving mechanism run from collector where pins control blade leading edges. Joint between blade and hub is a two-bolt connection with a pin of mating ground machined path. Helicopter is available for export, is basically the Russian-designed Mi-1, redesigned here by the NATO action. Quoted price for this model, demonstrated at the 12th International Aeronautical Show at Le Bourget, was \$51,000.

there are pedals (10) for controlling the steering rotor, as it is still called, the tail rotor.

During straight-line flight it is as simple as the pedals are always kept in neutral. In a helicopter the position of the pedals changes, depending on the regime and speed of flight. In lowering the helicopter the right pedal is moved forward, as though an obstacle at crossing speed the pedals are almost in neutral position, and, finally, in gliding with the lifting rotor an automatic system, the left pedal is pushed forward more than half way.

Pinch Control

Between the instrument panel and the pilot's seat there is a stick (11) for controlling the cyclic pitch of the lifting rotor. On the pilot's right pedal there are automatic forward, double and switches for the various instruments of the special equipment (12).

Now the right-hand pedal, on the floor, has two levers. One switches the clutch for engaging the transmission (13), the second the transmission braking (14). Before starting the lever must be pulled back as far as possible, the clutch is disengaging, and the transmission is locked. These levers have reciprocal locking. Without first having released the transmission brake it is impossible to engage the clutch and, with an engaged clutch it is impossible to back the transmission.

The engine starting unit is on the right side of the pilot's seat.

Before starting the engine, the helicopter must be slowly field down to speed without going to neutral prop.

demanded in the ground. It is also necessary to be sure that for a distance of 5-6 ft around the helicopter there are no light objects (rocks, bones, pebbles, etc.) which can be moved by the air stream from the lifting rotor and can damage its blades. All the blades of the lifting rotor must be placed on the forward support.

Having lost make sure that the clutch engaging and transmission braking levers are in back position, it is necessary to check whether the fire and oil tanks are open and whether the collective pitch stick is let down. Then the throttle adjustment grip is set in the middle position of low throttle and pressing all the engine is accomplished by a starting pump. Having given the command "contact," the pilot opens the starting coil and then gives the starting handle.

Having made sure that the oil pressure is normal (no less than 45-100 psi) and having given the engine an opportunity to operate for several seconds at low revolutions (500-1000 rpm), it is then necessary to increase the engine revolutions to 1250-1400 rpm in order to provide heating of the throttle adjustment grip. When the oil temperature is no less than 90°C and the cylinder head temperature is 35-100°C, avoiding (avoiding) of the transmission can be started. To do this, after first having released the transmission brake, it is necessary to give the clutch engaging lever, instead of, and then with an even movement shift it to the first detent, keeping it at this position.

After releasing the transmission

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A black and white photograph showing a portable electronic device housed in a rugged carrying case. The case is open, revealing various knobs, switches, and a control panel. A cable connects the device to a large, circular gauge or meter with a needle and scale, which is also shown in a separate inset image.

[illegible]

101 Honda has taken special note that engine is running with a guaranteed reliability of 7.9% in the range of 5,000 RPM. Additionally, the latest Honda engine is used in Honda's latest model, the Honda Civic. The Honda Civic is a four-door sedan with a 1.8-liter engine. The Honda Civic is a four-door sedan with a 1.8-liter engine. The Honda Civic is a four-door sedan with a 1.8-liter engine.

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The JFPAF is a worldwide unit... by the U. S. Navy and Air Force as well as by major allies and major manufacturers. Why, when it comes for computer information.

indeed, the helicopter's lifting rates will begin to slow down. After discharging the clutch lever the lifting motor will begin to increase its revolutions arbitrarily. The handle with the letter H on the revolution counter will move in the area marking and will show that the revolutions of the lifting motor are increasing. Simultaneously the helicopter shows a slight tendency to turn left. It is not so difficult to counteract this tendency of the helicopter since the effectiveness of the steering (tail) state is very small owing to its small number of revolutions.

After waiting several seconds until there is a matching of the needles on the revolutions counter and after putting once more on the catch of the church engaging lever, it is necessary to advance it to the detent.

When the clutch lever was moved approximately half way, only the bottom part of the clutch was engaged. The mutual slippage of the leading and following parts of the fastener clutch prevents the transmission and the lifting motor to increase greatly. However, the bottom part of the engaging clutch doesn't ensure a reliable connection of the engine with the transmission. Therefore, with further shifting of the clutch lever, a new section, which securely connects the engine with the transmission, is engaged.

After engaging the clutch, it is necessary to check the oil pressure and temperature in the main reduction gear. If the pressure is 30-75 psi and the temperature is 35-95°C, then the engine can be tested. Before this, it is once more necessary to be sure that the

behavior is possible that does a

Control of the collective pitch stick with the left hand and the helicopter control stick with the right hand, the pilot may now start timing the engine. To do this, holding the control stick in neutral position, the pilot should lean the throttle adjustment grip to the middle position. Then, having passed on the catch device, he should start moving the collective pitch stick upward, toward himself, with a steady motion. The direction of the pilot's engine must be such that he can the engine control instruments and also observe simultaneously the area in front of the helicopter.

While the process of opening the flaps and raising the engine revs takes one should check, on the amount and smoothness of their reaction by means of the revolution counter and check, as the manifold pressure by means of the pressure feed indicator. When the engine is running, it can be checked by ear. When the revolutions reach 2050 per minute and the manifold pressure reaches 18 in., one should, after having released the clutch, let the collective pitch stick in this position and check the readings of all the engine instruments. Items which are checked are: engine speed, the helicopter lift with all the gears and struts, the moving gears.

ABSTRACT Helicopter is utilized by Soviet aerial medical service, along with AN-2 and Yak-11 aircraft. Effectiveness of standing (air) cot on the three-bladed MAI is often considered as it is fairly low now.

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technology incorporated for practical engineering in the Stroukoff C-134 is the first of a new generation of military transport aircraft.

pitch stick should be shifted further upward so as to obtain a suitable view of 15 in. and revolutions of 1700 per minute.

Timing is accomplished by pulling on the appropriate disc(s) on the lifting line of the lifting rotor—making left turns with the help of the reaction moment of the lifting rotor and right turns by increasing the thrust of the driving (tail) rotor.

A reflexively large horizontal component of the lifting force of the lifting rotor is required to move a helicopter along the ground. This can be achieved with a large pitch of the automatic track (variable) plate so is a large amount of lifting force from the tail rotor. Each of these methods is dead weight on the aircraft. A large pitch of the automatic track plate is undesirable because there is a possibility of lifting the blades against the lower supports of the hub. The second method also won't do by itself.

It follows from this that the lifting power of the lifting rotor must, during landing, have a magnitude which is caused by situations of a certain number of engine revolutions.

Tail Characteristics

In calm weather, it is recommended that housing on dual hand ground be done in the following manner: First turn the throttle adjustment grip to its middle position (if it had been in the extreme position (the exposed). Then it is necessary to increase the engine revolutions to 1700-1750 per minute by moving the collective pitch stick upward while simultaneously keeping the helicopter from turning left with the pedals. After achieving the specified conditions, the collective pitch stick should be fixed and the helicopter's (cyclic pitch) control stick should be moved any time the pilot about half the full distance.

Keeping the (cyclic pitch) control stick in this position, the pilot should always attend to the helicopter's cyclic control movement. The pilot moves the (cyclic pitch) control stick gradually toward him to the degree that the landing speed increases. With a steady rising speed, the cyclic pitch control stick must be in a middle position between neutral and the deflected position (provided at the moment when the helicopter starts moving).

During taking along a concrete surface, the speed must not exceed 30 mph. In taking over hard ground with little grass cover, the speed should not be above 5 mph. The requisite speed is maintained for the appropriate degree of deflection of the cyclic pitch control stick.

Taking over soft ground has its own special characteristics. Then, for example, after taking the requisite degree

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To direct expanding electronics programs, facilities at Chance Vought in Dallas. The electronic warfare, guidance, repair, maintenance who can step into leadership of our most dynamic department. Candidate should have advanced B.S. degree, at least 10 years electronic experience and 5 or more years of well-defined management responsibility.

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Available in 1/64, 1/16, 1/8, 3/16 and 1/4 inch widths, in Off-white. Also available in black and black on special order. Write for prices and samples.

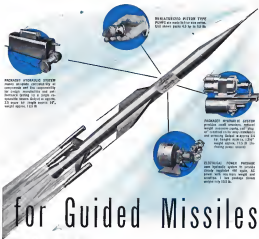
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As made for use in series, 100 to 400 gpm (4 to 150 lpm).



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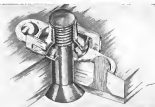
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Write for New Bulletin A-5216

3445

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

FASTENER PROBLEM



Lightweight floating anchor nut for bolting non-parallel surfaces

THE PROBLEM: Using large single bearings for smooth ballistics, wing center sections, spar and rib offers manufacturers many advantages. It simplifies design and reduces milling costs, and it provides greater strength while reducing air frame weight. However, this type of construction also causes fastener problems. For example, attaching spar and components to these curved forgings is difficult because the bolt head and seating surfaces are not parallel. Two methods are frequently used to make the fastening area parallel. They are: 1) spot face machine the mating surface; 2) build up each bolt head or nut base with tapered shims. Because there are often hundreds of fastening points, both of these methods are economically costly and time consuming.

THE SOLUTION: ESNA's redesigned lightweight self-locking anchor nut (Type LHA3032) solves this fastener problem, eliminates these costly, time-consuming and machining operations and significantly steps up production.

Type LHA3032 consists of a steel nut body with a constant spherical base. The counters and pinches the nut to move automatically with a ball point action to engage the bolt threads. Two lips retain the nut on the bolt and control the "nut" to 8° on any diameter.

Type LHA3032 is made of stainless steel for use at temperatures up to 550° F. It meets AN-N-10 performance and MIL-N-55007 (ASG) tensile and proofing strength criteria. Load a 1/2 Electric Shop nut, it is vibration proof and reusable.



MAIL COUPON FOR DESIGN INFORMATION

ESNA, Inc., 10000 N. 10th Ave., Suite 100, Denver, CO 80231

Please send me the following information:

☐ Bulletin on self-locking nut ☐ I am a designer of nut products. What fastening technique would you suggest?

Name _____ Title _____

Firm _____

Address _____

City _____ State _____

Zip _____

Stitch Ground

Turning on very sticky, rough ground (mud, plowed land, deep snow, high grass, etc.) is hazardous. In such cases, movement within the boundaries of the area we covered and by doing it on the sticky (10 to 15 ft). Attempts to turn on sticky, rough ground of the non-normal engine revolution end in failure.

Some pilots, in trying to force the helicopter to move by raising the collective pitch stick, increase the horizontal component of the lifting force of the lifting rotor. The increasing lift decreases the position of the rotor against the ground. The helicopter begins to move forward. When this occurs, owing to the increase in the positive moment of the lifting rotor, the thrust of the steering (tail) rotor also increases greatly. Because the pilot, in increasing the helicopter's tendency to turn left, pushes the right pedal of the foot control forward.

The increased thrust of the steering (tail) rotor, along with decreased wheel pressure against the ground, moves the helicopter to the left at the same time that it goes forward. When upon a small bank of earth is formed in the ground on the outside of the left wheel of the landing gear. This bank prevents the helicopter from going to the left. Then, under the influence of the steering (tail) rotor's locking action, the helicopter will begin to lean to the left. Although to counteract the leaning by increasing the control stick, the side cannot really be steered. The helicopter, having turned over, has ended on accident.

When the helicopter turns to the left, it is necessary by quick action to shift the collective pitch and throttle stick to a lower position, at the same time pushing forward (to the left) the left pedal of the foot control.

With the lowering of the collective pitch and throttle stick, the lifting force and the reactive moment of the lifting rotor decrease sharply. However, the revolution of the lifting and steering (tail) rotor will decrease slowly. Therefore, in pushing the left pedal forward, the thrust of the steering rotor tilting the helicopter to the left is decreased. If the leaning is noticed too late, it is advisable to lift the helicopter off the

Engineers: This coupon means action!

Success of X-10 Test Missile program
steps up systems engineering work on
Intercontinental SM-64 Navaho



The pace is quickening, as we gather forces for the climactic effort on the Navaho. If you like excitement in your engineering—this is it! You can decide now, and still get in on the work coming up at North American's Missile Development Division. It's going to be an assignment you'll be glad you took part in for years ahead.



James R. Garry, Jr., has been with NAD's SM-64 program since 1957. He holds both BS and MS in Mechanical Engineering from Case Western Reserve, and is a member of the American Society of Mechanical Engineers. He is currently in charge of the development of the SM-64 missile. He is also in charge of the development of the SM-64 missile. He is also in charge of the development of the SM-64 missile.

does, automatic ground handling, branching—the works. Now you can join us... get in at the forefront of missile technology. If you do you're going to build a weapon with the world's most advanced self-contained guidance system... driven at supersonic speeds by both rocket and swept engines... and packing an accuracy/payload punch that's unequaled in the foreseeable future.



Thomas R. J. Garry, Jr., is a senior staff engineer with NAD's SM-64 program. He holds a BS in Mechanical Engineering from Case Western Reserve and an MS in Mechanical Engineering from Case Western Reserve. He is currently in charge of the development of the SM-64 missile. He is also in charge of the development of the SM-64 missile.

MISSILE DEVELOPMENT DIVISION OF NORTH AMERICAN AVIATION, INC.



Mr. R. L. Cunningham, Engineering Personnel Manager, Dept. N-7

1225 E. Lawrence Boulevard, Aurora, Ill.

Dear Mr. Cunningham:

Please send me career information on Missile Development Division. I am interested in the following fields: ☐ Systems ☐ Guidance ☐ Structures ☐ Propulsion ☐ Components ☐ Check-Out ☐ Ground Handling ☐ Maintenance ☐ Other: _____

Name: _____ Home Address: _____

Education: _____ Home Phone: _____

Experience: _____



CECHOSLAVIA The Avia 14 is a direct successor to the DC-3. Note cockpit windows which make for good side visibility.

Czech Avia 14 Stresses Short Field Use

By David A. Auderlin

Fast—Short field performance is the strong selling point for the Avia 14, designed in its Czech manufacturer as a development of the Russian Ilyushin Il-12 trainer.

Tailoff and landing figures quoted are less than 2,000 ft. on grass or an improved field.

Timed tailoff runs made during the 1958 International Aeronautical Salon at Le Bourget were all close to the 15 sec mark, approximately two-thirds of the total figure for contemporary competitors.

Billed as a direct successor to the Douglas DC-3 by the Czechs, the Avia 14 was shown at Le Bourget in a 23 seat version, different in layout from the

four entrances offered in the sales brochure.

Standard layouts are for 24, 28 and 32 passengers and a 12-place executive version can be had.

Cabin decor at the place at Le Bourget was in walnut and beech, and the seats were comfortable and wide-spaced. A built-in baggage tray is part of the standard equipment. Cabin is not



NOSE GEAR (left) has welded link assembly. Main gear (center) is simple layout of welded components plus few subassemblies. Reinforced wing flaps (right) are sealed with rubber strip at leading edge for cross operations minimizing drag.



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ANTENNA on forward fuselage belly in typical of strike types used on Beech Tapered Vixen 141. Forward up a notch, not a selective method.

prepared but is ventilated and heated in the usual way.

Powerplants are a pair of M 53-T Turbofan turbo-propellers rated at 1,900 hp each for take-off. These are generally identical to the ASH-62 engines used in the T-38C. They are long low-bladed AV 50 propellers.

Like an A-10, it has a tail fin and tail landing ridge, cockpit windows and antenna masts. The cockpit windows are also heated electrically and fitted with slanted types. Aftview is also used to heat the propellers. Wheel doors are hydraulically operated.

Price: \$350,000

Prices quoted for the 24- and 28-passenger versions are approximately \$350,000 each. The 22-place version is only being built for export service.

The delivery dates quoted may vary with the model. Five planes could be far ahead in a prospective contract this year with delivery dates in 1958. The 32-seat version will become available at the end of July 1959.

Quoted Performance Data for Cessna A-14 Transport

Maximum speed	290 mph
Cruise speed	275 mph
Maximum speed	48.5 mph
Time to climb to 3,280 ft	3.2 minutes
Service ceiling	12,000 ft
Range	1,245 mi.
Takoff distance	1,475 ft
Landing distance	1,085 ft
Weight Data	
Empty weight	27,200 lb.
Maximum loaded weight	34,200 lb.
Useful load	16,000 lb.

New SPS High-Temperature Fasteners Have 170,000 psi Tensile Strength at 900°F

Ni-Ti-Ni bolt and nut developed by SPS research help solve Mach 3-4 fastening problems



NEW Ni-Ti-Ni BOLT is made of a low work steel (Inconel 600) has 220,000 psi tensile at room temperature, 170,000 psi at 900°F. Components flexed without failure. Ni-Ti-Ni bolts made of AMS 4184 material, has a single strength to achieve the full tensile value of the bolt at 900°F.

MECHANICAL PROPERTIES OF Ni-Ti-Ni BOLT

Properties	At Room Temp (5)	At 900°F	At 900°F
Ultimate tensile, psi minimum	220,000	170,000	170,000
Yield strength, psi minimum	180,000	140,000	140,000
Elongation in 4 diam., % minimum (specimen)	10	10	10
Reduction of area, % minimum (specimen)	30	30	30
Shear strength, psi minimum	140,000	140,000	140,000
Brinell hardness, for 100 lb. force			130,000
Fatigue strength, psi (1,000,000 cycles) 90% probability	80,000	80,000	80,000
Impact strength, ft-lb (Charpy)	15	15	15

NEW Ni-Ti-Ni BOLT has 50-70% greater tensile strength at 900°F than standard alloy steel fasteners commonly used at this temperature. Above data are for A-14, not material properties.

In response to the aircraft industry's request for a fastener with high strength and stability at Mach 3-4 temperatures, SPS has developed a 12-point external wrenching bolt with 170,000 psi minimum tensile at 900°F. Classified as EWB-Ti-Ni 9, this remarkable new bolt—made of a 9% chrome steel—can survive stresses at 900°F that most other high-strength bolts at room temperature. And it retains its high tensile strength even after long exposure to heat. Other properties, such as shear, fatigue and stress rupture, are also superior—both at room and elevated temperatures.

To match the EWB-Ti-Ni 9 bolt, SPS has produced a new corrosion-resistant flexed self-locking nut—EWB-Ti-Ni 9. Made of AMS 4184, a unique 16% nickel austenitic stainless steel, the EWB-Ti-Ni 9 bolt and nut are flexed in a defined deformation plane that resists the accelerated oxidation effects of high temperatures and corrosion at room temperatures.

With their high strength-to-weight ratio and ability to withstand the distorting effects of heat, the EWB-Ti-Ni 9 bolt and companion locknut give the designer an important new tool with which to solve the fastening problems presented by high-speed, high-temperature flight. Ni-Ti-Ni fasteners are available in 12-point external wrenching hex head bolts and locknuts in diameters from 1/4 to 1 1/2 in. The same material and processing procedures can also be applied to shear bolts and other special applications. SPS Aircraft Products Division engineers are ready to work with you in applying these new fasteners to your specific high-temperature problems.

Properties	At Room Temp (5)	At 900°F	At 900°F
Ultimate tensile, psi minimum	220,000	170,000	170,000
Yield strength, psi minimum	180,000	140,000	140,000
Elongation in 4 diam., % minimum (specimen)	10	10	10
Reduction of area, % minimum (specimen)	30	30	30
Shear strength, psi minimum	140,000	140,000	140,000
Brinell hardness, for 100 lb. force			130,000
Fatigue strength, psi (1,000,000 cycles) 90% probability	80,000	80,000	80,000
Impact strength, ft-lb (Charpy)	15	15	15

AT BOLT THE NEW Ni-Ti-Ni BOLT offers mechanical properties exceeding those of an MS 10084 alloy steel at room temperature. Typically specified in this charted, Inconel 600/Inconel 600, it retains superior properties even after long exposure to high temperatures.



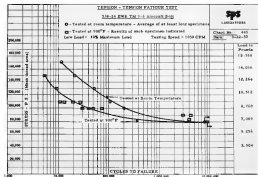
EXCEEDS THE TEMPERATURE RANGE. An EWR Tin 9 bolt is positioned for testing on a tensile machine equipped with a furnace that is accurate within $\pm 1^\circ\text{F}$ up to 2000°F . Air-furnace research done on the EWR Tin 9 are the most extensive ever assembled for a production fastener. They include the fine design and stress correlations for bolts under heat.

Hardware for High-Speed Airframes

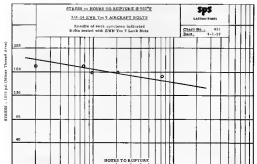
The SPS crash program on a new high-strength, high-temperature fastener began late in 1955 following the aircraft industry's demand for hardware for SR-71 class temperatures. A year later the first EWR Tin 9 bolt was produced. This was possible because of SPS's extensive research and test facilities built up over the years, and the largest in the industry.

With high-strength fastener fabrication techniques well on hand after development of the EWR 11 bolt (150,000 psi) and the EWR 22 bolt (225,000 psi), the biggest problem was to find an alloy of the desired mechanical properties at elevated temperatures. Many materials were subjected to exhaustive testing. Finally Vanoxel 800, a 5% chromium hot work die steel made by Vanadium-Alloys Steel Co., was chosen. Its stability and strength at high temperatures largely determined selection of it.

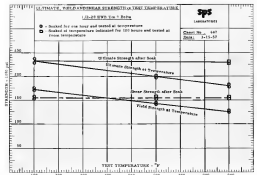
The other major problem was plating. Cadmium melts at just above 500°F and diffuses into the bolt metal, causing embrittlement. Research turned up an existing plating technique—AMS 2466—that proved to be the solution. This form is applied as separate layers of cadmium and nickel. After plating, the parts are heated to 510°F , at which temperature the two metals diffuse into an alloy that successfully resists the accelerated oxidation and corrosion caused by high temperatures.



TENSION-TENSION FATIGUE TESTS of 318-14 EWR Tin 9 bolts showing values obtained when tested at room temperature and 1987°F . It should be noted that the fatigue strength at 8,000,000 cycles is approximately the same at both test temperatures.



HIGH TEMPERATURE STRESS RUPTURE tests of 318-14 EWR Tin 9 bolts with EWR Tin 9 Lockwash show a life of 1800 hr at 240,000 psi (10^7) of yield strength. Long-life results from a combination of high strength material, advanced techniques, and advanced design, including SPS 11 & thread form. H & thread has a greater area; reduces stress up to 50% compared to the minimum stress concentrations at the weakest point of the bolt, and thus operates fatigue strength and stress rupture life.



318-14 EWR Tin 9 BOLTS show high values for ultimate, yield and tensile loads at 1987°F and at room temperature after 100 hr soak. Because they retain superior mechanical properties even after long exposure to elevated temperatures the new EWR Tin 9 bolts offer surface designers a solution to the problem of fastener deterioration in high Mach numbers.

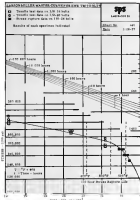


FIG. 1 LARSON-MILLER STRESS RUPTURE CURVES for a threaded fastener were plotted in SPS Laboratories with data obtained from high-temperature rupture tests and stress rupture tests run on the EWN Tin 9 bolt. From these curves the stress rupture point in the graph (shown) of time can be calculated. For example, for a life of 10,000 hr. at 900°F, it is shown that the EWN Tin 9 bolt will withstand a stress of 130,000 psi.



EWN Tin 9 Flexloc Locknut Develops Full Strength of the EWN Tin 9 Bolt

The EWN Tin 9 self-locking nut is made of A305 6006 (tinplate). It has ample strength to resist the full tensile value of the EWN Tin 9 bolt at all temperatures up to 900°F. Configuration of the EWN Tin 9 locknut distributes the load over nine initial threads (not as conventional fasteners). Its design helps reduce stress concentrations to a minimum. Like its companion bolt, the EWN Tin 9 locknut is plated with a diffused cadmium-metal capable of resisting the destructive effects of temperatures up to 1000°F.

For more information on SPS Tin 9 fasteners, write Aircraft Products Division, STANDARD PRESTRESS STEEL CO., Bethlehem, Pa.

STANDARD PRESTRESS STEEL CO.

AIRCRAFT PRODUCTS DIVISION

SPS
STANDARD PRESTRESS STEEL CO.

How SPS Hi R Thread Form Increases Fatigue Life



Burkhead Compressor Photograph of MIL-S-7732 Thread (Flat Thread) shows with oval root stress points of high stress concentration which reduce fatigue life.



MIL-S-7732, Hi R-7732a Threads (Larger R 800) 41, more uniform surface reduces stress concentrations, increases fatigue life.



Hi R Thread Form (Increased root radius 800) 41 reduces stress concentration 40% faster for greater life than standard thread. Thread assemblies with standard tapered holes and nuts.

Britain May Use Princess In Atomic Aircraft Project

London—Britain's Ministry of Supply is considering use of a Saunders Roe Princess flying boat as a testbed for its atomic aircraft program.

The three Princess has been on contract at Southampton since their development as conventional aircraft was written off, largely due to lack of adequate engines. Although considerable time and expense would be required to make them operational, the use of at least one of the flying boats might be an attractive proposal, particularly since the British have been concentrating on supersonic designs for their atomic aircraft development program.

It is believed that the Bristol Proteus 755 turboprop engine might be used in the powerplant.

Dutch Company Will Build Fairchild Automatic Rifle

Fairchild Avenger and Engine Co. has recently signed an agreement with Artisan Industries allowing release production of the Avenger automatic rifle (AW-100, p. 25) in Holland.

The Dutch firm will have production and sales rights in the Netherlands, Germany, France, Italy, Austria, Belgium, Luxembourg, Spain and Portugal.

Company plans to be tested for production of the lightweight automatic rifle by next Jan. 1.

North American to Expand USAF Plant at Palmdale

North American Aviation Inc., will contract a 70,000 sq. ft. hangar, four times of current flight ramp, a single wing reflecting tower and other facilities to be constructed in a \$1,712,000 Phase II construction program at its USAF Plant 42, Palmdale, Calif.

Site completion is scheduled for April, 1955. Architect and engineer firm is Woodford and Brown. Construction contract is held by Mandelbuck Construction Co.

Lockheed to Install Cynosaut for Tests

Lockheed Missile Systems Division will install a cynosaut at its Palo Alto, Calif., research laboratory. Cyt is intended to produce liquid helium which will be tested in a low temperature bath for atomic and other types of gas, and liquid helium for certain studies of unusual properties of the gas itself.

Cynosaut is to be installed in August, will produce 1,000 liters per month.

ENGINEER OPPORTUNITIES AT RAYTHEON



AT RAYTHEON AIRCRAFT IN CONSTRUCTION TOWER overlooking Raytheon's Flight Test Facility at Bedford, Mass., engineers work on vital missile projects in an informal atmosphere that stimulates creativity.

Advanced work with prime contractor for Army Hawk and Navy Sparrow III

The caliber of Raytheon engineering is an indication of the quality of our staff. Raytheon is the only electronics manufacturer with generic contracts involving complete systems responsibility for both air-to-air and surface-to-air missiles.

As an engineer in our Missile Systems Division, you associate with men of top national reputation in understanding small groups. Our expanding development has created interesting openings in:

CIRCUIT DESIGN	SPECIFICATIONS
ELECTRONICS PACKAGING	TECHNICAL WRITING
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ANTENNA DESIGN	MECHANICAL DESIGN
TUBE APPLICATIONS	HEAT TRANSFER

Please send brief outline of your background to: G. P. O'Neill, Raytheon Missile Systems Division, Box 5A, Bedford, Mass.

RAYTHEON MANUFACTURING COMPANY

Missile Systems Division
Bedford, Massachusetts

RAYTHEON

Engineers in Electronics

Are you the
ONE MAN IN THREE?





TAIL HOOK extended, German F4U is hoisted aboard the new 10,000-ton aircraft carrier Saratoga as ocean suitability tests in the Atlantic Ocean. Tiger is using water landing system (right, center). Approach system, raised deck, which stretches out at sea to right. Vespene pulled over stern inside McDonnell F4U Drones and Douglas AD Skyraiders, testing optical illusion Drones is equipped with popples.

F4U Carrier Suitability Tested on Saratoga

STEAM trials from Saratoga to Tiger in Saratoga. Trials took place in early morning hours in shadow of deck handling crew and black lines indicate. Black lines stretch into deck. Saratoga's number 68 is visible on bow.



ISLAND of the big carrier Saratoga's F4U parked on deck. NATC markings indicate aircraft is assigned to Naval Air Test Center, Fort-Ret River, MS. Model is equipped with Curtiss-Wright J65 jetprop. Modification, the F4U IF has General Electric J79.



Career Opportunities For Research, Development and Production Engineers

MANY ATTRACTIVE OPPORTUNITIES—like the F-27 on the facing page—are being equipped with Honeywell Aero's control systems. And Honeywell Aero's advanced systems programs will be many more yet to come. These positions existing current in Minneapolis. No. 10 engineers in these areas:

General Guidance Systems • Digital Computers • Flight Control Systems • Engine Power Controls • Engine Inlet Deflector Controls • Air Data Computers • Navigation Computers • Fuel Management Systems • Ventilation, Rate and Heading Gyros • Transmitter Amplifiers • Instrumentation

Opportunity through growth! Engineering personnel at Honeywell Aero has made this simple since 1917, and it's still growing faster than the average industry average. Future growth looks even more promising. Its rapid technological advances in the aircraft and missile fields are driving more and more complex integrated flight control and weapons systems.

Developing and producing these systems at Honeywell Aero's business Honeywell Aero possesses the mass production of the most precise of all systems—the control systems with the only manufacturing in the U.S. producing a computer has Honeywell has generated over 40,000 flight control systems, more than any other manufacturer and has long been the leading supplier of LARS, the most exact size altitude landing system.

Join the leader in this expanding field of aerospace controls. Make Honeywell's growth, your growth and 43 year future with opportunities.

Act now!

For more information about your career opportunities at Honeywell Aero, send your resume to: Division 13, Mail, Tenthredin Division, Dept. TA-101, Minneapolis-Honeywell Aero Division, Minneapolis 15, Minnesota.

Honeywell

H. Aeronautical Division

High Speed Vehicles Compared

San Francisco—How long range high velocity vehicles—ballistic, skip or glide aircraft—compare in performance was described at the recent American Rocket Society meeting here by A. J. Eggen, Jr., of Ames Aeronautical Laboratory.

Eggen reports that the ballistic flight path is least efficient from the standpoint of the velocity required at launch to obtain a given range. An advantage is that convective heat trans-

fer to the nearby body can be reduced by designing a blunt body to raise the ratio of pressure drag to friction drag. Effect is a lesser requirement for cooling.

The hypersonic glide, with lifting drag ratio of about 4, is much superior to the ballistic mode in ability to sustain velocity to range. It has the disadvantage of requiring some kind of conversion. Much heat can be isolated



Hailed as the DC-3's successor and scheduled for airline introduction in December, this 40-passenger Fairchild F-27 relies on a Honeywell Fuel Gage weighing less than 5 pounds installed. In addition to low power requirements this all-transistor gage is accurate to within 2%. It also has the ruggedness demanded by America's first short-to-medium-haul propjet. It's another example of Honeywell leadership in measurement and control systems for aircraft, missiles and rockets.

Honeywell

H. Aeronautical Division

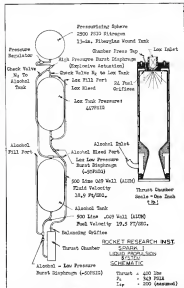


DIAGRAM of Thrust 1, a single liquid propellant rocket for basic group testing, shows details of liquid propellant system. Design was created at ARS meeting.

Germans to Activate First F-84F Wing

By Claude G. Weber



USAF instructor points out location of F-4F dog chute to German student officers. Each German pilot gets more than 14 hr. of dog in the fighter bomber.



FLIGHT instructor at Lockheed Air Base, Palmdale, is one of program's instructors. Average age of Luftwaffe recruits is 35.



THREE GAF students, shown at Keesler Air Base, will be part of more 2,000 pilots and 20,000 technicians necessary to man 3,121 jet fighters four years from now.

For the first time, German—German Air Force, now about 15 months old, will activate its first wing of Republic F-84F fighter bombers, within three months. The wing will be an operational training unit, preparing new pilots and veterans of the Nazi Luftwaffe for later transition to more modern aircraft.

For the present, there is no speculation as to USAF or the GAF about what follow-on equipment may be provided but American officers assume the Germans will procure the best weapons systems they are competent to handle. By the end of 1955 there should be about four active wings in the GAF, starting the buildup to a 20-wing force by 1965.

Almost all the GAF will be tactical units. Two transport wings are programmed, with the rest of the force devoted to intercept, fighter-bomber and reconnaissance aircraft. USAF spokesmen who have been in charge of the training program predict GAF personnel will make an easy shift to guided missiles if and when they are available for the mission.

Training Sites

Training program is conducted at a complex of three USAF bases in this part of America. In addition to Keesler Airfield, nicknamed "Fanny" by the Americans, major installations are at Lockheed and Keesler. First class of GAF pilots qualified at the Lockheed T-33 was graduated last September.

At that time the staff of Keesler got a new job of providing advanced fighter training. Today the field has a large number of F-84F aircraft equipped with the German cross. Each GAF pilot gets more than 34 hours of dog in the fighter bomber, of which 11 hours are in formation.

In addition, there is work on checks and emergency procedures, high speed maneuvers, superior dog, and recon. Two hours of formation training are flown at night. Aerobics covers all maneuvers that can be studied in a cockpit. Instrument training includes fly hours in the C-119 transport trainer.

Col. Mark H. Vincent, Jr., USAF base commander, told American Wings the massive technical revolution in aviation of the past 12 years has coincided with the resurgence of Luftwaffe training to force increased emphasis on instrument work at this center.

New pilots in the war years had specialized training to enable them to do a particular month on a limited number of types of missions. They rarely



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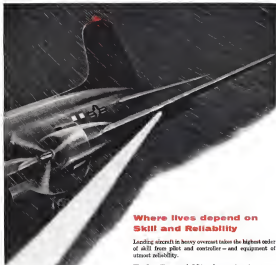
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1st Lieut. JOSEF KAMMUBER

but no good overall cockpit evaluation. Result is that the new GAT training program for these men includes a high percentage of time on instrument and communications problems.

Personnel Needs

To run 1,125 fast lane jet aircraft four years from now, GAT will need about 1,600 pilots and 30,000 trained technicians. Initial effort to select Luftwaffe veterans fell far short of expectations. So far about 300 men have recruited and their average age is nearly 36 years. When the program was launched early in 1956, German citizens officially reported at least 1,100 of Hermann Göring's old losses to air over the rail.

Col. Vossler does not attribute this to lack of enthusiasm for the NATO cause or inadequacy of the Soviet threat in Western Europe. He believes it is a conscious, that age's no return age questionable and inflated in the weakening German economy. He should note for the GAT are about one-quarter of those provided by USAF.

There is a persistent recruiting hes-

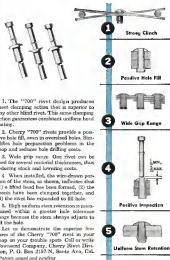
German Production

Boeing/Westland AB, Germany—The United States has given 150 airplanes to the German Air Force, and there is no indication that the money amounts to produce in one modern jet fighter.

Only German-made aircraft now being produced in the Dornier DO-27, a high-performance observation plane for use by the German GAF may at some time purchase locally-developed trainers but there is no program under way as yet.

Army pilots are trained by the GAF at Monheim, a flight pilot training center about 50 miles from Munich. Both land wing and helicopter crews are trained there, then returned to their Army units.

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see **SPRAGUE** for filters

38,000 trained technicians and there should be 5,000 graduates in the Krieger classes at all times.

Spokesmen for USAF say they plan to have more operational requirements for GAF before the end of this year, probably with the attraction of the best of GAF's 20 wings at Boeing. German industry has assumed the job of supplying maintenance facilities and replacement parts wherever possible. Col. Vincent says USAF supplies only "hard core" items such as communications and electronic equipment in addition to the fighter and transport planes themselves. In the near future, Canada will provide a number of Canadian-built F-80s.

Total strength of GAF today runs at about 10,000. Actual strength figures are not available but Col. Vincent estimates GAF eventually will constitute about one-third of the entire German military force of 500,000 men.

Transocean Acquires Atlas Subsidiary

Los Angeles—First step in a major development program was taken by Transocean Corp. of California by acquiring all the Atlas Co., Inc., which owned subsidiary of Atlas Corp.

Under the terms of the agreement, the present management of Transocean will assume full responsibility for the operation of the merged company. A second step in the overall program will be the public offering of Transocean securities to provide approximately \$6.7 million in air working capital and for the immediate purchase of long-range Lockheed Constellation.

The Atlas Co. has several facilities at Phoenix, Arizona, London, N. J., and St. John, Quebec, and is a large dealer in aircraft engines and parts.

Britain's May Exports Total \$29 Million

London—Britain exported \$29 million worth of aviation products in May, to set a high mark for 1957.

Aviation exports brought in about \$16 million more than in May, 1956.

Aircraft and engines accounted for \$18 million and engines \$9,450,000. Electrical parts and appliances, tires and instruments also were exported.

Total for the last five months of this year amounts to \$133,765,000, of which engines account for one-third. Snyder was Britain's leading customer last month, buying \$13,136,000 worth of aircraft and parts.

The United States was next, with \$10 million worth of orders. These came from Canada, France and Australia.

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Illustrated above are typical structural mechanical aircraft parts and assemblies currently being manufactured in the two divisions. The aircraft divisions operate under Air Force approved Quality Control systems. Each division possesses the most up-to-date equipment for its specialty including many pieces of equipment designed to meet a particular need.



Convair B-58



Boeing B-52



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Marines Fly FJ-4s, F4Ds

Marine Fighter Squadron 325, based at MCAS, CA, recently completed carrier qualifications in their North American FJ-4 Phantoms. Fly photos and video pictures of squadron show that only one fighter in doctrine appears to have achieved perfect, which extends from left wing of No. 3 airplane. Squadron, nicknamed "Death Riders," is commanded by Lt. Col. Daniel L. O'Connell. All Weather Squadron 115 (AWACS) was first to arrive Douglas F-4D1. Marine Squadron also is based at MCAS.



$$T = 2\pi\sqrt{\frac{R}{g}} = 84 \text{ MINUTES}$$

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AVIATION WEEK, July 8, 1957

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Inertial Guidance was made possible only after 10 years of developing precise enough components to instrument the earth's radius pendulum. For more than 10 years, Kearfott has been developing and producing floated gyros, accelerometers and computer elements for inertial applications. For over 7 years, these components have been applied to the inertial systems now in development, flight test or quantity production at Kearfott. Today, Kearfott is unique in the field of inertial guidance. By virtue of the components now available and the developments under way, coupled with our experience in precise navigation systems and inertial guidance, only Kearfott offers the advantages that experience implies.

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Supplementing the Inertial Guidance Systems, there are in production at Kearfott, precise 3-axis reference systems type 801 by the examples illustrated below.

INERTIAL SYSTEM PLATFORM

This three gyro inertial platform is a reproduction of the units now in production at Kearfott. It incorporates accelerometers, three rate integrating gyros, data processing components and base structural design which exemplify the current state of the art.

Kearfott also manufactures the subgraves and computers associated with this platform. It provides precise inertial navigation for every aircraft application.



CENTRAL GYRO REFERENCE SYSTEM

Based on a 3 gyro 3 gimbals 10 pound inertial platform, this system provides a precise vertical reference (2 milliseconds) under all dynamic loads. Standard and 80101 in an all-Integrate Company System with 17 per hour random drift rate.



ALL-ATTITUDE COMPASS SYSTEM

The 3 gyro 4 gimbals platform, illustrated weighs 10 pounds. It provides a precise all-Integrate compass system for high performance fighter aircraft. Accuracy drift rate, less than 1" per hour. Also provides precise vertical reference.



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These weather items prepared in consultation with the United States Weather Bureau

WEATHER AND RADIO

HOW WEATHER CONDITIONS AFFECT THE PROPAGATION OF RADIO WAVES

RADIO ABSORPTION may vary from poor to exceptional, depending on the temperature stratification. Temperature reversions alter reflection characteristics of the atmosphere. This can result in faint reception over great distances on VHF channels.

Precipitation static—ice crystals, snow flakes and rain droplets striking aerials can cause crackling in headphones.

Static due to lightning discharges. These occasional bursts and crashes can be picked up at considerable distance. It is often your first indication of thunderstorm activity.

How to minimize static: Change altitude if it can be done safely. Because speed is not so slow on some. Where possible, avoid dry snow and even clouds composed of ice crystals. Keep radio volume turned low on relative background noise. It is preferable to use a higher frequency broadcast station for ADF heading instead of low frequency range station. During periods of noise, push head phones over temples when not listening—to keep fingers to minimize



Aurora Borealis, associated with magnetic storms. These rare terrestrial phenomena cause communication failures. Tune in to Time Signal Broadcast of National Bureau of Standards (5 or 14,800 kilocycles for frequency of periods of poor reception).

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MANAGEMENT



TRG's stress shows Union Square in New York. TRG engineer and technician prepare radio antenna for test. Small check table in TRG's posthouse laboratory (right) is used to investigate means for electrical interference and separate test study.

Air Problems Attacked in Mid-Manhattan

By Robert Cushman

Growing tendency of aircraft to form independent teams to sell their analytical talents to the armed services and industry is illustrated in the offices and laboratories of TRG (Technical Research Group) in mid-Manhattan, New York City.

Here is a mid-Manhattan location, mostly known for foreign department stores and busy late outlets, a team of scientists, under the management of fellow scientists, is working on problems of optimum shielding configurations for the USAF nuclear launchers (WS-115), representing new and older aircraft.

Job Shop

TRG is one example of the "atomic job shops," a type of firm which has become of particular interest because of the industry-wide shortage of scientifically trained engineers. Unlike their counterpart, the design job shops, the scientific job shops have often proved their inherent capacity to handle even full fledged industrial firms.

Burns-Widevine Corp., Los Angeles, Calif., has been cited as the classic example of this type of outfit. Another example is NDA (Nuclear De-

velopment Corp. of Annapolis, White Plains, N. Y. Both of these firms are now considered specialized industrial firms.

Other Examples

Other examples, which like TRG have not yet launched out and acquired sufficient assets to be considered self-sufficient, but appear to have the technical personnel to do so, are Aerometrics, founded by Princeton University, uses tools to circumscribe their outside consulting work (AW Aug. 13, p. 67), and Coastal Nuclear Engineering Corp., Danvers, Fla. Known as Dr. Walter R. Zern, former director of the Argonne National Laboratory.

The one thing that the various examples of this type of firm appear to have in common is their rapid growth. They often expand from a handful of founding members to many times the original numbers. In a few years, however, they often find growing pains which are diagnosed as "lack of management know-how."

Then there is a crisis out of which the successful ones emerge, very likely with the aid of outside capital (AW Dec. 31, p. 67), transformed into substantial members of the industrial community. Others like TRG, isolated

Research Laboratories, Baltimore, Md., which is now research and development division of Aerometrics Manufacturing Corp., Middlebrook, D., are purchased by companies which find they are short in R&D engineering talent.

TRG is in the growth phase. In three years it has grown from a few founding members to almost 300 employees. In this phase, its income is derived from its investment of their capital study and development jobs. Though TRG does not consider itself an aeronautical firm, 90% of its present income comes from research related to aircraft systems solutions.

Wide Diversity

TRG's diversity is remarkable. Its projects include nuclear reactor physics, radiation damage to materials, high temperature materials, electromagnetic problems associated with missile navigation, nuclear input steering systems, automatic high speed accuracy, display units, low noise noise amplifiers, dynamic frequency standards, and super-sonic flow.

Explanation of TRG's ability to handle the scope of fundamental work is the fact that almost all of its employees are men with degrees being obtained in the fields of science and



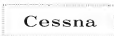
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abstract is considering them for its gravity experiments. Rome Air Development Center plans to use them to improve the Navaho navigation concept which penetrates the maze in electromagnetic waves from a ground station prior to each attack.

Still another use for atomic clocks mentioned by TRG is for synchronizing the ion stream "out" pulses of ground beacons while a country is under attack so that these aids may be used for the debarking, interception and retaliatory bombing but not be available for the enemy's attack. In that way, very short "beeps" would be sent out from the ground beacons according to a signal to the coded schedule.

The friendly aircraft equipped with the code and atomic clocks would know precisely when to expect the pulse. Meanwhile, the unexpected enemy would not be able to benefit.

Many Agencies

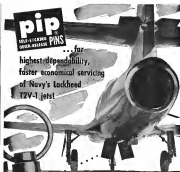
TRG has worked for a large number of government agencies in its short life. It has had contracts from the Cambridge Research Center, Wright Air Development Center and the Office of Scientific Research. Recently, after a visitation to AIRDC, Baltimore, TRG was qualified for a "systems acquisition scheme" on the anti-ICBM program.

Anti-ICBM worries exist in less than six months since ICBM was once lost in its phantom drive through the upper atmosphere from, say, 300,000 ft., and not an intercepting missile.

Besides USAF agencies, TRG has worked for the Office of Naval Research, The Applied Physics Laboratory, Johns Hopkins and the Oak Ridge National Laboratories. General Electric Co., Ohio Allison Co., Allen B. DuPont Laboratories and Brunswick



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Model "B" PIP Pin is lockhead T2V-1 pins, lock assembly, flip disc, spring and retaining bracket, disc, double-acting conversion. A blow on the head of the pin with a plastic mallet permits rotating lock to rotate into body of pin so pin shifts to its lock.

PIP Pins are available in sizes to meet lock standards and a 1/2" x 1/2" design for 1944 and 1945.

For complete literature, write to: Bulletin 100-1000.

**AVIATION
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When T2V-1 jet is loaded with PIP Pins, it can be serviced in 10 minutes. (Left) T2V-1 jet, (right) T2V-1 jet, (center) T2V-1 jet, (right) T2V-1 jet.

Navy Unveils APN-67 Doppler Navigator

By Philip J. Klaus

First details on its AN/APN 67, a 200-lb self-contained doppler autonomous navigation system which gives the pilot his true ground speed, distance traveled, drift angle, deviation from desired course and his present latitude and longitude were revealed by Navy Aeroautical Co.

Overall system errors are quoted at

about 1%, with distance traveled errors less than 1%, tracking errors in the heading reference and an action when used over water.

The APN-67, in pilot production for the Navy, is one of 11 U. S. doppler autonomous systems recently disclosed by the Defense Department. Development followed similar action in Britain and Canada on doppler systems that were developed by British

and Canadian Marconi companies. This opens the way to dual use of the technique which has proven so reliable in military applications, particularly over mine and equipped with ground-based aids. Interest in the technological advances now advanced by these large firms in Britain for the Atomic Energy Electronics Engineering Co. (AEEEC) working under doppler systems was a major impetus.

Lightweight Claim

Even now its APN 67 is the lightest weight doppler autonomous now in production, a claim which may hinge on the definition of the word production. Several other lightweight systems are currently in design or prototype stage.

Labentier For Electronics is building prototypes of its APN 105, a dry gas self-aligner comparable to the APN 67, which weighs about 130 lb. General Precision Laboratory recently received a contract from Martin to produce its APN 101 in 85 lb. doppler system that provides only ground speed and drift angle information. The British Marconi A20150 doppler system weighs about 130 lb. (It was shown at the ASEE meeting.)

Soon itself has a new system under design, called the Model 1072, which provides APN 67 features plus ground speed and distance to destination information. A stepped down version, called the Model 114, will provide only ground speed and drift angle. It weighs about 85 lb. from tests.

All of these systems employ similar doppler techniques, i.e. measuring two or more radio beams at the horizon measuring the doppler shift resulting from aircraft or missile motion (AW Feb. 4, p. 51).

The number of navigation services provided depends on the sophistication and complexity of the navigation computer used.

APN-67 Features

The 200 lb. APN-67 provides the following navigation information:

- Ground speed
- Drift angle
- Present position, in latitude and longitude
- Ground track and deviation from desired course
- Distance traveled along the ground

With the addition of a 25 lb. dual circle computer, the APN-67 can also

give the pilot his great-circle course and distance to his destination, or back to his base. For distance along great-circle, a 12 lb. dual-circle computer can be used.

The APN-67 includes ground speed and drift angle autonomy programs which enables the system computer to operate in a dual redundancy mode whenever there is a momentary loss of signal, for example, during aircraft maneuvers or when radio altitudes must be maintained over course hazards. For military use which may include short continuous outcropping, a 12 lb. dual compass computer can be added which provides more accurate drift tracking.

Continuous-Wave

The APN-67, and its civil counterpart, employ continuous-wave (CW) techniques, in contrast to Navy's early prototype unit in developing a guidance system for its Pegasus missile. Initial APN-67 research was carried out by the Naval Research Laboratory. The APN-67 operates at a frequency of 13,500 mc and includes power of about 300 watts. The system includes the following major elements:

- **Receiving Transmitter**, which includes an integral feedback control system and reflexes. The antenna reflector, a modified parabolic shape, is divided into two halves by a vertical partition (septum), one half used for transmission and the other for reception. Its a break, on the other side of the antenna longitudinal centerline, the antenna receiving portion of the reflector to protect two beams, used off, one or other end of the search longitudinal centerline. Two or more beams transmit selected energy received from the ground to their respective microwave aerial direction, whose superimposed rays are used to produce an interference signal corresponding to the doppler frequency shift. For the range of aircraft speeds at which the APN-67 is designed to work (50 to 500 kts.), this results in a doppler shift of 1 to 16 kc.

- **Signal Data Converter (SDC)**. This is a dual-channel amplifier which employs narrow bandpass filters to locate and track the pre-selected frequency in the doppler shift spectrum, which corresponds roughly to the doppler shift that would be obtained if the radio beams were infinitely small in diameter. In practice, they are about 2 to 3 degrees. The SDC introduces an error and compensation for the fact that the pre-selected frequency is not exactly the same as the beam center. Either of two different compensations can be selected by the pilot depending upon whether the aircraft is flying over land or water. The output of the signal data converter consists of two separate signals,

Doppler Who's Who

Following is a list of the 11 U. S. military doppler navigation systems recently disclosed by the Defense Department and the equipment manufacturers:

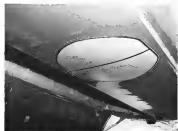
- APN 66: General Precision Laboratory. (Auto-navigator)
- APN 67: Ryan Aeronautical Co. (Auto-navigator)
- APN 71: Avco Associates
- APN 76: Labentier For Electronics
- APN 79: General Electric. (Auto-navigator)
- APN 81: General Precision Laboratory. (Ground speed, drift indicator only)
- APN 82: General Precision Laboratory. (APN 81) plus Fuel Instrument ASN-6 navigation computer)
- APN 83: General Precision Laboratory. (Modified APN 81)
- APN 86: General Precision Laboratory
- APN 87: Ryan Aeronautical Co. (Eight-channel version of APN 67)
- APN 89: General Precision Laboratory. (APN 81) plus Fuel Instrument ASN-7 navigation computer)
- APN 102: General Precision Laboratory. (Ground speed, drift indicator only)
- APN 105: Labentier For Electronics. (Auto-navigator)



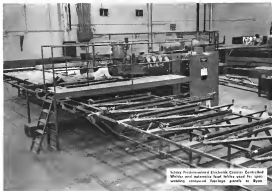
AN/APN-67 doppler navigation computer gives pilot his present position (latitude and longitude), drift angle, ground speed, distance traveled, ground track and deviation from desired course without reference to any ground-based navigation system.



SMALL, light-weight receiver/transmitter, shown installed in A10, is linked with . . .



FLASH antenna and reflexes, divided into two halves for transmission and reception



Sciahy Preformed Electronic Control Controlled Welder and automatic dual helix used for spot welding aircraft fuselage joints at Ryan

COMPLEX SPOTWELDING PROGRAM AT RYAN IS SEVERE TEST FOR NEW SCIAKY COUNTER CONTROL

Ryan Aircraft Company, San Diego, California has achieved a milestone for its automatic welding—automatic spot welding of large reinforced fuselage joints for the Boeing KC-935 and "707" jets.

Referring to their new Sciahy Counter Controlled Welder, Mr. Bob Pullerton, Ryan's Senior Welding Engineer, stated, "This is one new welding development that really does what the advance automation promised."

PRECISE CONTROL

Early in the program, it became obvious that precise control of all welder functions and absolute production consistency of nothing was repeated. Introduction of the new Preformed Electronic Counter Controlled Welder by Sciahy helped solve this problem.

Here, for the first time, is a welder in which fuselage size controlled on a function of a cycle of alternating current. Control settings are retained with accuracy. The unwavering accuracy of precision is assured and throughout the entire range for the longest run at the highest production rate. Any production control setting is readily reproducible at any time.

COMMITMENT, SAFE WELDS

The consistently safe welds produced by the Sciahy Counter Weld Control are ascribed to the Ryan program since the idea is a local learning member. In addition, the size of the assembly—largest every unit constructed in the industry—will not detract from the possibility of repeat due to independent welds.

The importance of consistently perfect welds is emphasized by the tremendous number of operations in the six fuselage sections of the Boeing jet model transport. Approximately 77,000 spot welds are required in just alone in skins, stringers and doublers and numerous and bulkhead components together.

TAPE COMMAND OF WELDING OPERATIONS

Welding operations on the various assemblies can be controlled by a tape command unit providing complete precise positioning in all directions. Automatic

interlock between positioner and welder is required. This would provide safe automatic operation.

COMPLEX TOOLUP

Handling and positioning the aluminum skins also presented a major problem. Ryan solved this by installing large positioning tables with push button controls to permit automatic loading.

The effectiveness and consistent operation of the Sciahy Counter Controlled Welder combine perfectly with the automatic abilities and consistency of the Ryan positioning table to satisfy the requirements of this complex production welding operation.

LITERATURE AVAILABLE

Technical bulletins completely describing the new Sciahy Preformed Electronic Counter Weld Control are available. Write us your company interest requesting Bulletin 555 and 552.

SEIAKY

Helps Put Profit Into Manufacturing

Sciahy Bros., Inc., 4925 West 87th St., Chicago 38, Ill., Portsmouth 7-5600



RYAN APN-67 employs automatic error techniques and two beam aimed air.

can be measured to part beam diameter shift, the other to standard beam shift.

•Crossed Miles & Draft Angle Computer (CMDA) This electromechanical analog computer first compensates the part and standard angles for aircraft pitch and roll and drafts change which otherwise would introduce error. The compensated draft angle is then added vertically to produce a signal proportional to aircraft ground speed since the direction of aircraft heading. Substituting the two draft angle signals produces a signal proportional to aircraft drift. The vector addition of the two and difference signals is proportional to airplane ground track. These three output signals from the CMDA are used to activate cockpit

ground speed, drift angle and course deviation (true desired track) indicators as well as to provide inputs to an automatic navigation computer.

Two Computers

Ryan offers a choice of two types of navigation computers for use with the APN-67.

- Both are electro-mechanical analog types.
- Crossed-mile computer continuously and automatically determines and indicates draft angle course and distance to one desired destination or waypoint.
- Rhumb-line computer gives rhumb-line course and distance to destination,

for lighter type aircraft which operate over shorter distances.

The good-mile computer includes built-in cross compensation for angular course, difference between true and magnetic north and compass error (magnetic deviation).

The APN-67 analog computer was developed for Ryan by Kollsman Instrument, Inc. in the end-draft angle subassembly. Ryan plans to use electronic analog computation, employing reaction and potentiometer in robot computer sight and map according to John Brinkley, of Ryan's electronics engineering department. The Model 100C also will provide data stabilization for



Two APN-67 analog computers. Unit shown calculates ground position and course deviation. Unit below computer distance traveled and draft angle.

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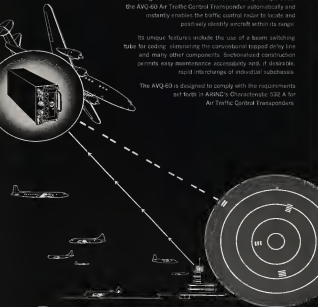
RCA ANNOUNCES... THE

AVQ-60 AIR TRAFFIC CONTROL TRANSPONDER

Designed for airline, business, and military transport use, the AVQ-60 Air Traffic Control Transponder automatically and instantly enables the traffic control radar to locate and positively identify aircraft within its range.

Its unique features include the use of a beam switching tube for coding, eliminating the conventional tapered delay line and many other components. Sectionalized construction permits easy maintenance accessibility and, if desirable, rapid interchange of individual subchassis.

The AVQ-60 is designed to comply with the requirements set forth in ARINC's Characteristic 532 A for Air Traffic Control Transponders.



Custom Aviation Equipment

RADIO CORPORATION of AMERICA

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APN-67 inertial sensor is fixed in belly of A-1H about two feet forward of wheels.

grate angle of aircraft pitch and roll than the APN-67, currently limited to about ± 15 degrees.

CW vs. Pulse

Although there is general agreement that doppler auto-tracking systems are a promising future, there is a strong split over the relative merits of CW systems and pulse-type systems. There is perhaps the loudest proponent of CW, General Personnel Laboratory and Laboratory for Electronics located in the pulse camp.

Here are some of the advantages that

beam systems offer for their CW approach:

- **Flash-mounted, non-rotating antenna**
- **Less complexity in system design**
- **Greater signal-to-noise ratio at high altitudes**—This is particularly important over smoothly water where signal returns are low. Tests run on the APN-67 at 40,000 ft, 450 lb show a signal-to-noise ratio of 38 db over land, 21 db over sea water in broadest sea state 1 (relatively smooth), according to Bendon.
- **Lower power**. In a CW system the

energy is concentrated in a narrow frequency band, not dispersed in a number of sidebands as in pulse-type systems. This has points for: Total power consumption of the APN-67 is less than 1 kw. from sea.

• **No "ultra-side lobe" problem**. This phenomenon, characteristic of pulse-type systems, occurs when a pulse of radio energy makes waves in the same instant as a pulse is being transmitted causing loss of the returned signal. Changing the pulse repetition frequency can reduce the effect, but adds equipment complexity.



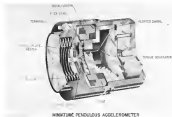
• **Photo-electric IR detector**—Photoelectric type IR detectors, especially sensitive out to a non-closely of an infrared source at Naval Air Development Center, Johnsville, Penn. Technical report on device will be made soon for distribution to qualified government industry representatives.

• **ICAD Phase Scatter Network**—Desert coast telephone link between Europe and America, using three forward scatter radio stations and a sea, Atlantic cable, has been announced by International Civil Aviation Organization. Radar network is slated to be operational in 1965 and will provide one voice and



Missiles on Soviet Destroyer?

Two Soviet destroyers bound for the East pass southward through San Diego. All director and track correlation of coast radar scans. Men Tennyson could control installation of U.S. destroyers. Among radar antennas appearing on coast in Shalor surveillance radar antenna similar to type used by U.S. with only 5G order. Egyptian Coast Authority officials quoted Reuters as saying they were en route from Alexandria to Vladivostok.



Integrating Accelerometer

Miniature integrating accelerometer employing piezoelectric gage principle has threshold of 0.000 G's, measures only 175 in. long by 175 in. diameter, weighs 0.4 lb. New integrating accelerometer, developed by Minneapolis-Honeywell, is a cylindrical device, as compared to recently released miniature integrating gage (MIG).

four telephone channels. Scatter airframe will be located at Boeing Co.'s Grand Central, and at Rockport, Ireland. Cable will connect Rockport with Port Wick, Scotland.

► **MIL To Produce "Meth"**—North American Aviation has located Marine Corps' Honeywell to manufacture the Intracommunications Digital On-line Test writer (IDOT) developed by its Rock-

port division for recording 128 different temperatures, percent and/or stress readings simultaneously. System is chosen provision for installation into battery rack for automatic computer processing of the recorded data.

► **Bell Landing System**—Chief-of-Navy will issue until required version of the Bell Aircraft automatic landing system aboard an aircraft carrier for operational evaluation.

► **Passive Radar Reconnaissance**—Rand Air Development Center has awarded contract to Stromberg-Carlson for development of ground-based reconnaissance system using new type radar technology. Stromberg-Carlson, with contractors as possible include Comair Helgar and Inland & Barnes.

► **PAA to Evaluate Synchronous Detection**—General Electric's researchers are testing technique will get its operational evaluation. In this American Airways in the Pacific area to see if it can measure, frequency output experimental radio conventional AM to high frequency even modulation.

► **New USAF Radar-Borden Radio** will develop new air traffic control surveillance radar, with range of more than 100 miles, under 53.5 million contract received from Rand Air Development Center.

► **Too Many Connected**—Increasing number of technical innovations and trade shows and cost of exhibiting at such shows has prompted Radio Electronics Television Manufacturers Association to send its member questionnaire to its members. Object is to determine what type, size and number of shows which members want consider in their exhibit planning. Results will be announced later.



Hughes has been the leader from the beginning in applying electronic computers to airborne fire control equipment. Today every U.S. Air Force and Canadian conventional defense interceptor uses Hughes' design and Hughes-manufactured systems.

Product Design at HUGHES WEAPON SYSTEMS DEVELOPMENT LABORATORIES

As the technical problems become more and more automatic, additional equipment such as semi-type computers, control surface (CST), autopilots, and other units must be integrated into the system. Faster speed and heavier engines demand more accuracy—and hence less space for electronic gear. The result is even more integration and cost-effective packaging, evolved from special techniques.

This all means that now the product design engineer is more important than ever before. In the Product Design Laboratory he is a vital part of the formal link between the Research and Development activity and the optimum configuration and installation arrangements for the system "black boxes."

HUGHES Scientific Staff Reliance

RESEARCH AND DEVELOPMENT LABORATORIES
HUGHES AIRCRAFT COMPANY
Culver City, Los Angeles County, California

These positions in the Product Design Laboratory are open now in the Weapon Systems Development Laboratories:

IN THE WEAPON SYSTEMS AREA

ENGINEERS

To work on design and construction of airborne instrumentation equipment.

ENGINEERS

To engage in the design and fabrication of all airborne instrumentation equipment for guided missiles.

ENGINEERS

To participate in development, design and production construction of electrical and electrohydraulic power supplies.

IN THE RADAR FIRE CONTROL AREA

ENGINEERS

To do equipment development and design, design an optical military field test equipment for support of fire control radar, fighter identification, and instrument auxiliary equipment.

ENGINEERS

For circuit and equipment development in the field of airborne communications and navigation systems.

ENGINEERS

Experienced in computer or related fields in developing military field test and auxiliary equipment for support of airborne computers.

You are asked to send resumes of your education and experience in the address at left.

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the LEWIS ENGINEERING COMPANY
Naugatuck, Connecticut



NI-10 Indicator

Miniature direct-reading temperature indicator, Type NI-10, indicating positive number type zero ranging type display in stead of pointer for greater accuracy. Developed by Douglas Aircraft Co. in flight test program for driver control in test models one ranging temperature range of -100 to 500°F, the other 100 to 900°F. The Hamilton Electronics Co., Van Nuys, Calif. will produce new indicator under Douglas license.

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it also implies progress
...The improvement of quality and service.*



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TWA Begins Jetstream Service

Trans World Airlines has begun service to Europe with its new Lockheed L-1011 jetstream transport. The new four-engine aircraft has a maximum weight of 169,000 lb., more than previous models. First commercial flight carried 170 passengers, 100 crew, and 100 cargo. The aircraft, which has increased wingpan and wingtip, and electronic thrust to keep all four engines turning in the case of engine failure, is being offered. TWA has received from Boeing a 1000 propeller planes (AFB Feb. 1, p. 40).

Expansions, Changes In Avionics Industry

Raytheon Instrument Corp. has opened a new \$100,000 research and production facility at its Research Park, N. Y. plant. Facility is producing flight gear and avionics for production releases of 10 millionths of an inch, company says.

Super controlled vibration has an effective system which keeps out dust particles to within 0.1 micron (1/2 millionths of an inch).

Other recent announced expansions and changes in the avionics industry include:

- Bedford Corp. and Electronics Corp. will merge with Sigbee Corp. of Bedford, Mass., to become operating divisions. Electronics is parent company for Chicago Radio & Television Co., Long Island City, N. Y.; Bedford, El Segundo, Calif., makes strictly bearing equipment; Sigbee, with executive offices in Anaheim, Calif., is an electronic equipment manufacturer. Group companies will be headed by John G. Brooks, president of Sigbee, and are expected to grow more than 575 million annually.

- Radio Corporation of America will build \$10,000 sq. ft. electronic system laboratory near Bedford, Mass., on Route 125, to house operations now located at Waltham, Mass.

- Sperry Rad Corp. will build 52 mil. lbs. facility at Chomley, Pa., for development and testing of microwave and electronic test equipment. New facility is slated to be in operation within a year, as expected to employ 150 scientific and technical people.
- General Television Products Corp.

has moved to new, larger facility at 36 Sylvan St., Woburn, L. I., N. Y.

- Leland Electric Co., division of American Machine & Foundry Co., has moved all engineering and sales personnel for aircraft products to new 140,000 sq. ft., 52.5 mil. lbs. plant in Wadsworth, Ohio.

Company expects to transfer all aircraft products manufacturing from Dayton to new Wadsworth plant within next few months.

- Stronberg-Chester has opened two new buildings with one million sq. ft. of additional space more than doubling previous Rockwell facility.

- Algon Products Co. has opened an operating offices of new plant in south of Ft. Lauderdale, Fla. New plant, when completed this month, will include production facilities.

- Minneapolis-Honeywell has completed transfer of most of its aircraft equipment engineering staff to new facility at St. Petersburg, Fla. Staff now numbers 300 and is slated to reach 500 by year-end.

- Lockheed's Missile Systems Division, Seterville, Calif., is building facility for design and testing of advanced missile systems and radar devices. Facility will include personnel for making reliability and utilization pattern research, a 38 x 70 ft. acoustic anechoic, and a declassification room for receiving declassification of various materials.

- General Precision Laboratory has



New Welder

Concentrated both can be welded to painted metal, wood, and plastic, and other extremely thin metal materials using new Duo-Weld Electrode Assembly developed by Unifab Corp. for use with its Wellbore spray-on welder.

INFRA-RED IS ULTRA-MODERN



In the past few years, the development of infra-red devices has attained the dimensions of a technological breakthrough. In this period, the Electronics and Space Division of Aerojet General Corp. has become the national leader in the development and manufacture of infra-red equipment.



Recruit often qualified engineers and scientists unexcelled opportunities in every area of the profession and population field.

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Branches: 10000 Wilshire Blvd., Los Angeles 40, California

Write: Director of Research and Development, Aerojet General Corp., 10000 Wilshire Blvd., Los Angeles 40, California



X-7 Command Station

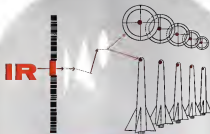
Lockheed X-7, in composite photograph (above) over Holloman Air Development Center, Alamogordo, N. M., will be controlled from ground by new command station (below). Lighting, color and intelligibility of instruments were arranged by team of experimental psychologists and engineers to minimize operator's error, insure error. Simulated at scale of ten per cent of ground three-dimensional simulated targets which indicated pitch and roll were changed to two dimensional flight indicator displaying pitch in degrees and roll with wing movement from horizontal line. Lockheed said that entire representation of attack due mostly from Navigator's report was accurate reproduction.

NEW AVIONIC PRODUCTS

Components & Devices

- opened 11,100 sq ft environmental test building at Pleasantville, N. Y.
- ElectroData Division of Bannockburn Corp. has completed enlargement of its Pleasantville, Calif., plant, providing total floor space of 155,000 sq ft.
- The Rental Co., Waukegan, Conn., has opened new branch factory and repair laboratory in 6100 East 46th St. in Los Angeles and a service facility at 3607 West Alhambra in Houston, Texas. Company also moved its Pittsburgh office to 2716 Northview Rd.
- Consolidated Electronics Corp., Pasadena, Calif., has established a new division to be called DataTape Division. It will specialize in electronic design and manufacture of a wide range of equipment for recording and reproducing equipment.

Miniature sealed rate gms, Model 55-000, is available with maximum rate of 1 to 1,000 degrees per second, replaces electronic input unit with high power output. Damping ratio variable.



INFRA-RED

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For 14 years Aerojet-General has pioneered the research and development of infra-red devices. Now, Aerojet and Aerojet alone have perfected the high-volume production of infra-red systems for:

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GUNFIRE CONTROL



Electronic engineers...physicists... Aerojet invites you to prepare your own targets, "look out" your own future... in the dynamic new field of infrared.

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Arrowhead, the only single source for these three types of aircraft ducting, has the experience, the ability and the facilities to answer your ducting problems. Arrowhead field engineers are located in all major centers.

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Manufacturing, Inc.*

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is installed within 0.1 over temperature range of -19C to 85C. Nilesen & Kiefer Corp., Cosmopolis Road, Brookfield, Conn.

• **Miniature mic gage, Type GN,** is available with full scale range up to 600 degrees per second with overshoot and resolution of 0.01 degrees per second, suitable for operation at temperatures of -51C to 100C under 10C linear vibration from 0 to 2,000 cps and shock up to 100G. Gage has variable resistance, pull-off with buttons, of 0.1 to 10 in available full scale range, within 2.5 hr full range. Unit measures 1 in dia x 2 1/2 in long, weighs 3.5 oz. Minisco Corp., Haverhill, Boston, Ill., 1480 Golden Field Road, Boston 35, Mass.

• **Positive ingotburn potentiometer, Model 190,** designed to isolate open, available with standard lengths of 0.50 in better type resistor. Unit has standard resistance range of 10 to 10,000 ohms, with standard tolerance of 3%. Temperature range is -50C to 100C; fully reproducible exceeds 2 million operations. Unit is available with number of taps as high as 100 (100C) only. Spectral Electronics Div., Carson Corp., 1234 South Del Mar Ave., San Gabriel, Calif.

Laboratory Equipment

• **Time-lagless bright converter, Model F11-180,** can increase brief intervals in the range of 0.25 millisecond to 1 second, with resolution times in the order of 40 microsecond. Transducer subject is in pulse whose amplitude is proportional within 1% to time interval being measured. Read-out can be accomplished by a photo channel pulse height analyzer or oscilloscope. El Duende Electronics Co., 1464 Middle Harbor Bldg., Oakland 10, Calif.

• **Dead Potentiometer, new type of test equipment,** provides two pulse traces with variable spacing and duration times, for simulating pulse patterns from real-type targets or unreciprocated because together. Driver repeatedly does the work of 25 single pulse generators of conventional type in cascade. Each trace has 10 pulses with variable spacing and duration times. Any of the pulses is a, be omitted or added to the pulse train.



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SLIDE RULE AND
CONVERSION
CALCULATOR!**

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25c**

Send 25c to cover cost
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HANDY! ACCURATE! SIMPLE TO USE.

This 1 1/2" circular Slide Rule has straight measurements printed on the face. Includes an Area Index (square feet) based on circle tables. Discountable conversion table: 1 inch to 10 ft, 100 ft, 1000 ft, 10,000 ft, 100,000 ft, 1,000,000 ft. All conversions in ft. Read once, answer on your scale. Dimensions: 1 1/2" x 1" and held in place by a 1/2" hole. Price: \$0.25.

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P 2427 Aviation Week 300 N. Michigan Avenue, Chicago, Illinois



FORMING TODAY'S TOUGHER, "HARD-TO-HANDLE" METALS TAKES THE IMPACT OF THE **CECOSTAMP**

THE CECOSTAMP provides a controlled impact blow not obtainable on any other press. The operator has, at his fingertips, full command of the ram for sharp blow or squeeze as the job requires. This control of the blow intensity assures the correct impact and precision required by the metal being formed. It easily forms, in a permanent set, the "hard-to-handle" metals such as heat treatable aluminum alloys, austenitic stainless steels, magnesium and titanium. There are standard CECOSTAMPs to fit nearly every requirement with working areas from 21" x 18" to 150" x 150". Stroke of ram can be increased for deeper draws if necessary.

Send for Bulletin 30-L-5

CECOSTAMP

CHAMBERSBURG ENGINEERING CO.



CHAMBERSBURG, PENNSYLVANIA

SOME OF THE ADVANTAGES OF CECOSTAMPS

1. Delta shape changes of most hard to permanent shapes
2. Produces compression to work on most aluminum and steel
3. Shaping can be controlled with stamping all shapes
4. Skilled operators can develop and draw many shapes difficult to form on any other type of press
5. Drawn blow is easily varied to form large or small parts
6. Low tooling cost and rapidity of die fabrication



BUSINESS FLYING



SHOULDER-WING LAYOUT with control surfaces is used on latest version of Goodyear Infanteo plane. Compact engine hangs at rear. Powered by a 44-hp engine, top speed is about 140 mph., range about 400 mi. It can be folded by household vacuum cleaner.

Cost Tempers Rubber Planes' Civil Hope

Improvements in rubber aircraft designs here and in England are shown in the latest configurations revealed by Goodyear Aircraft Corp. and M. L. Utility Aircraft, Ltd. Planned mainly for military applications, both aircraft are seen by their manufacturers as having potential development into low-cost lightplanes for pleasure fliers.

If such aircraft should develop, prices obviously would have to be scaled down from those previously mentioned. A Goodyear representative estimated that price of that company's GA-447 Infanteo plane would be approximately \$5,000 in large quantities, considerably above what most portable airplane pilots would probably want to spend for a type of such limited utility.

Goodyear currently is building 10 Infanteos under contract to Office of Naval Research, which will evaluate



LATER TWO-PLACE MODEL of Infanteo plane will seat two side-by-side, have a more potent fuel engine to improve performance. Project is being financed jointly by Navy and Army.



DELTA-WING INFLATABLE PLANE being inflated by British forces; single stick for thorough control. Fabric-covered model (right) seats two in tandem, weighs 65 lb. under engine desired to 16.5 hp. When collapsed, wing section is stored in small



How to make the most
of your engineering career
Start at a Boeing

go where engineers don't get lost in the crowd

One of the many benefits that can slow down your progress as an engineer is getting lost in the crowd. It can happen on smaller companies as well as on big ones. That's because you itself is not the victim. The thing to watch out for is the kind of company organization that somehow puts up and erases your individual identity.

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GOODFAR COCKPIT (left) with canopy lifted; speed, shows rather rather pitch, on floor sheet of steel, which slip over down. Nelson (right) (middle) can drive a compressor to keep them adjusted to proper position.



the aircraft's application as a reserve vehicle. The company has a two-phase version of the single seat GA-447 under development for ONR and Aeronautics.

The new airplane differs from earlier biplanes in configuration and construction. It is a sleeker-wing layout compared to the earlier piston model. Construction is entirely of reinforced nylon, trade named Aramid, the actual material while the cloth is woven here in the walls. Joining the carbon surface is a weave of continuous nylon strands forming as I have had varying structure when the aircraft is inflated. But then takes eight pounds/square inch pressure. Even the cabin panels are rubber.

Apparently the weight "of a man" the GA-447 is designed for, dropping from wing pack, built-in as cargo holder to cope of desired aircraft on land or in the water. An obvious characteristic of the inflatable plane is being evaluated.

Inflatable, has a wingspan and length of approximately 14 ft. Powered by a 44-hp Nelson H-5A engine, inflatable's top speed is about 50 mph, and design range is approximately 400 mi. Takeoff and landing can be accomplished within 200 ft.

M. L. Usher, Aircraft rubber airplane, has a revised control system using a single hanging stick, operating two

surface on the delta wing for long, medium, and short-handled control. Rubber pad is used only for marking the flexible nose wheel.

The thick wing has an NACA 0024 airfoil. Suspended from it is the two-piece fuselage, control car built up of a single wood framework, 14-in. cross-section.

Rigidity of the wing is maintained by connecting upper and lower sections with a series of positive, negative dampeners running spanwise. Landing loads are taken by vision lines from the wing to the fuselage.

Fuel tank of 7.5 U.S. gal. capacity each, are strapped under each side of

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The Aeroproducts ram air-drive pump, mounted behind the cockpit of the USAF F-100D Super Sabre, produces sufficient hydraulic pressure for flight controls in case of either engine or hydraulic failure.

The compact, lightweight unit is another product of Aeroproducts' extensive experience in designing and building essential aircraft components to meet specific customer requirements.

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MOTHAIR-SAELLIER ME-750 PARIS (topher to jet) has been ordered by several foreign government officials as a lightplane for transport. Built by option to build it under license in U.S., it awaits sufficient orders to warrant production here.

Latest Foreign Lightplanes at Paris Air Show



FLATHEAD F-333 (left) three place lightplane shown at St. Bourget Airport has a 240-hp Continental engine. Landing gear and wingtips fold up retractable. Vario from Continental light was Aero 1.60 short field airplane. (right) replace: West German showed Fischer two-place power glider with Poteb's engine. Propeller is split tip.





Light Radar for Light Twin

One of first installations of lightweight weather radar in a modern light twin business transport is the RCA AVQ-50 set in Reading Aviation Service's Aero Commander Super 650 demonstrator. Total weight of installation is 55 lb. Nose was reinforced to hold antenna and McMillan radome, a push-open flap near the access to faired-in antenna unit. Weathercock takeoff is mounted on instrument panel (see, bottom photo).



the wing after inflation, feed a 65-hp. Walter Minton four-cylinder piston engine destined to 38.5 hp. Problems of routing the engine has been the prime factor in delaying it.

Gross weight is 1,090 lb. and empty weight is 515 lb. Takeoff run is 270 ft when fully loaded and the range at 45-50 mph is approximately 125 mi. For transportation, the entire assembly can be rolled up and jacked into the aircraft, which is then towed behind a small car.

Cessna 310B Changes Are Largely Internal

Considerably redesigned interior is featured in new Cessna 310B light twin cockpit business plane aimed at improving pilot effectiveness, passenger comfort and increasing the plane's useful load. Powerplant remains the same two 240-hp. Continental O470M. Floor is paved at \$99,910. Window approximately 5100 higher than the last model.

Revised instrument panel has improved shielding to cut windshield glare and equipment has been reoriented for greater convenience; radio and navigation gear and controls being moved to the center of the panel for easy access from either seat. Design is aimed at increasing effectiveness of two-man operation during instrument or night and cross-country landings.

New instrument lighting system uses post-type red lights throughout which can be controlled by rheostats to provide adequately varied brilliancy in each of the four areas.

Larger overhead lighting console for red and white light dimensions includes an additional 5th outlet for the plane's oxygen manifold. An optional oxygen system package is designed to allow filling the cylinders without removing a flow from the airplane. Master control equipped now has radio rackings for correct alignment and those are three times as easy to adjust as the master control alone. This previously to allow easy accurate tuning. Other additions include a dual flow bypass and venturi fuel pump on the instrument panel.

Left ADP-12E and Avco-Radio Corp. ADP-21 are both offered as optional equipment on the 310B and a single Sole Flight speed indicator is available in a dual-mounted unit.

Lower interior sound levels have been achieved by increasing windshield and other window thicknesses, new construction and an additional 25 lb. of sound-proofing material has been installed. This is placed in the entire cabin structure, especially in the floor and side panels, wing walls, rear baggage and

40 years
and
1,060,744
KVA
later...



Westinghouse equipment for B-57C: (1) Standalone Constant-Speed Drive and Westinghouse 40 KVA, 480-volt, 60-cycle Generator; (2) Rectifier-Capacitor Bank; (3) Transformer-Rectifier; (4) Control Transformer Assembly.

USAF B-57 "Hustler", America's first supersonic bomber, Convair Division, General Dynamics Corp., Fort Worth, Tex.



First airborne generator, shown on Billy Mitchell's Sped 16, Warde Company of the Smithsonian Institution, Washington, D.C.

Westinghouse is still the leader in airborne electrical power!

From the single-blade, wind-driven Westinghouse generator above, shown on Billy Mitchell's Sped 16, to the amazing electrical components of Convair's supersonic B-58 "Hustler", is an epoch in air power.

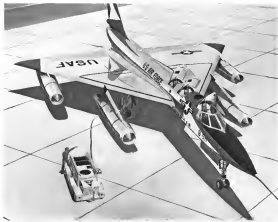
And it's an epoch Westinghouse helped pioneer with 1,060,744 KVA of service to the aviation industry.

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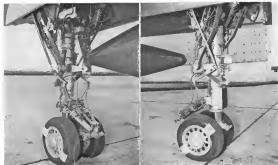
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Harrier's Complex Nose Gear

Three kind patterns of the new landing gear of C-57B Harrier. The gear is shown in its retracted position, revealing the internal mechanical components, including the landing gear strut, shock absorber, and various hydraulic lines and sensors.

check that, allowing that some wheels, to adjust in its correct vertical manner to clear the pad. Lines to the two nose wheel steering cylinders mounted directly there wheels and behind shock that are 3,000 psi high pressure high temperature tubes being reinforced with double wire braid and installed in Reinforced C-57B nose designations 8708 (AW 474 p. 95).

CAA Contracts

Following is a list of contracts awarded by the Civil Aeronautics Administration.

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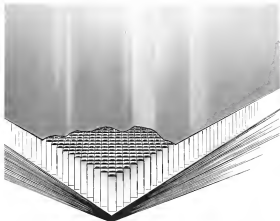
PROCESSES (Continued) Airline, West Coast, 100-100 for some aircraft maintenance (100-100).

Army Contracts

Following is a list of unclassified contracts of \$25,000 and over is released by Army contracting offices.

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British Fire Seaslug Missile In Navy Tests

Seaslug, a British sea-to-air missile, is being tested by the Royal Navy's guided missile ship. The test involves rocketing the missile when a target is reached and Seaslug is propelled after that by a single warhead.

"Triple ring" launcher, automatically fed from magazine below decks, is used to fire the weapon, in the case from the Girdle Ness launchers. British say that day's pitch and roll do not affect Seaslug's aim.

Four guided missile destroyers will be fitted with the weapon. Armstrong Whitworth was coordinating contractor for the weapon, and nine other companies participated, including Sperry Corporation, General Electric, Sir George Colville & Partners, McMichael Robt and Imperial Chemical Industries.



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C-130 Wing Panels Milled

Typical linear surface wing panels for Lockheed C-130 are milled at Portland Machine Tool Works, Sandy, Portland, Me. (above). Milled surface is kept smooth (below) while table holding panels is tapered. The 57 in. x 27 in. wide skin is 0.015 in. thick in the middle with the overboard 13 in. at each end tapered to 603 in. top thickness. Time before time for entire operation is 31 hours.



T-37 AT WORK

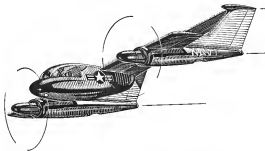
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